ISTANBUL TECHNICAL UNIVERSITY ★ GRADUATE SCHOOL OF SCIENCE ENGINEERING AND TECHNOLOGY

THE TRANSITION OF INSTITUTIONS BY MEANS OF KNOWLEDGE-BASED ECONOMY: CASE OF TURKISH UNIVERSITIES

M.Sc. THESIS

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Vuslat BOZDAĞ, a **M.Sc.** student of ITU **Graduate School of Science Engineering and Technology** student ID **502101014,** successfully defended the **thesis** entitled **"THE TRANSITION OF INSTITUTIONS BY MEANS OF KNOWLEDGE-BASED ECONOMY: CASE OF TURKISH UNIVERSITIES"**, which she prepared after fulfilling the requirements specified in the associated legislations, before the jury whose signatures below.

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FOREWORD

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ABBREVIATIONS

ABET : Accreditation Board for Engineering and Technology
APEC : Asia-Pacific Economic Cooperation
BILGI : Istanbul Bilgi University
BOPR : The Office of the Provost for Research
BTYK : The Supreme Council of Science and Technology
BU : Boğaziçi University
CES : Center for European Studies
CV : Curriculum Vitae
ERASMUS : European Community Action Scheme for the Mobility of University Students
ESMU : European Center for Strategic Management of Universities
EU : European Union
EUA : European University Association
FTE : Full-time Equivalent
GDP : Gross Domestic Products
GOSB : Gebze Organized Industry Zone
GRA : The Georgia Research Alliance
HEI : Higher Education Institution
IAU : International Association of Universities
ICEM : International Energy and Management Conference
ICTs : Information and Communications Technologies
IPRs : Intellectual Property Rights
IT : Information Technology
ITU : Istanbul Technical University
KBE : Knowledge-Based Economy
KEI : Knowledge Economy Indicators
KOSGEB : Small and Medium Enterprises Development Organization
KUL : University of Leuven
METU : Middle East Technical University
MoSIT : Ministry of Science, Industry and Technology
NGOs : Non-Governmental Organizations
OECD : Organization for Economic Co-operation and Development
PPP : Purchasing Power Parity
PRME : Principles for Responsible Business Education
R&D : Research and Development
RGP : The Research and Graduate Policies Directorate
SEFI : European Society for Engineering Education
SMEs : Small and Medium Enterprises
SU : Sabancı University
TEKMER : Technology Center
TTO : Technology Transfer Office

TU Berlin **:** Technical University of Berlin
TUBITAK **:** The Scientific and Technological Research Council of Turkey
UK **:** United Kingdom
UNGC **:** United Nations Global Compact
UNIMED **:** Mediterranean Universities Union
USA **:** United States of America
UT **:** University of Twente

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THE TRANSITION OF INSTITUTIONS BY MEANS OF KNOWLEDGE-BASED ECONOMY: CASE OF TURKISH UNIVERSITIES

SUMMARY

Knowledge is recognized as a crucial element of economic growth in addition to physical capital and labor and for having success with sustainable development is possible with knowledge creation, knowledge flows, and the capitalization of knowledge.

Competition and innovation conditions in today's world, force all of the institutions in an economic environment. With the evolution of knowledge economy, the importance of dynamic interconnections between the university, industry and government. Institutions whether public sector or private sector should transform to provide these requirements: strong relations and knowledge transfer with each other, being innovative and flexible. Since economy based on knowledge, universities are becoming more important and expectations from them are getting higher. Expected from the universities are having strong linkages and cooperation, being an entrepreneurial university, producing knowledge, having solid organizational structure. Alongside these expectations, change becomes obligatory to survive and be an important part of economic development.

This study reviews institutional transition in particular universities around the world by means of knowledge-based economy. The aim of this study is to comprehend the institutional transition by means of knowledge-based economy in general and transition of universities is investigated deeply among institutions as an important part for innovation and knowledge. Some universities from the world are examined about their management, productivity, and academic change. 4 Turkish universities, which are in Istanbul, Istanbul Technical University, Boğaziçi University, Sabancı University, and Istanbul Bilgi University are investigated as a case under three main topics; management, productivity, and academic. Deep interviews with vice-rector of these universities, who are responsible for instiutional management, R&D activities, research and application centers, industry relations are conducted and related indicators from university's databases are collected. New strategies, development axis, changes in academic structure, R&D activities, projects, industry relations and technology building are analyzed. As a result, it was concluded that the four important Turkish universities' evolution from their foundation until today has parallels with the evolution of universities abroad. This might also form a source for similar studies in the future.

BİLGİ EKONOMİSİYLE DEĞİŞEN KURUMSAL YAPI: TÜRK ÜNİVERSİTELERİ ÖRNEĞİ

ÖZET

Bilgi, fiziki sermaye ve işgücüne ek olarak ekonomik büyümede can alıcı bir unsur olarak kabul edilmekte ve sürdürülebilir kalkınmada başarı sağlamak için bilgi üretiminin, bilgi akışının ve bilginin sermayeye katılımının önemine dikkat çekilmektedir. Bugünün dünyasında rekabet ve yenilikçilik koşulları tüm kurumları yeni bir ekonomik çerçeveye uyma zorunluluğu ile başbaşa bırakmaktadır. Bilgi ekonomisinin ortaya çıkmasını ve gelişmesini sağlayan başlıca etmenler; küreselleşme, teknolojik gelişmeler ve bilginin ticari değerinin artmasıdır.

Bilginin üretim açısından bu derece hayati ve önemli bir girdi haline gelmesiyle, ekonomik dinamikleri açıklamak üzere yeni parametlere ihtiyaç duyulmaya başlanmıştır. Dünya tarım ekonomisi ile başlayan, sanayi ekonomisi, sanayi sonrası ekonomi ile devam eden ekonomik değişimlere sahne olmuştur. Günümüzde ise dünya teknoloji ve beşeri sermayenin önemli olduğu bilgi ekonomisi çevresinde dönmektedir.

Bilgi ekonomisinin gelişimiyle birlikte, üniversite-sanayi-devlet arasındaki dinamik ilişkilerin önemine dikkat çekilmektedir. Kamu sektöründeki veya özel sektördeki tüm kurumlar, birbirleriyle güçlü ilişkiler içinde olmak ve bilgi aktarımını sağlamak, yenilikçi ve esnek olmak adına dönüşmeleri gerekmektedir. Bu beklentilerle birlikte, değişim ayakta kalabilmek ve ekonomik gelişmenin önemli bir parçası olmak için gereklilik haline gelmektedir. Bu değişim zorunluluğundan yola çıkılarak tezin ana hipotezi "Bilgi ekonomisi kapsamında üniversitelerde bir dönüşüm olmaktadır" olarak belirlenmiştir. Hipoteze bağlı olarak üç adet araştırma sorusu ortaya çıkmıştır. Araştırma soruları: "Bilgi ekonomisinin taleplerine Türk üniversiteleri nasıl cevap vermektedir?", "Bilgi ekonomisi tarafından talep edilen kurumsal yapı değişikliği konusunda Türk üniversiteleri nerededir?" ve "Türk üniversitelerinin dönüşüm süreci nelerden etkilenmiştir, neleri etkilemiştir" şeklinde tanımlanmıştır. Tez çalışmasında bu üç araştırma sorusunun cevabının verilmesi amaçlanmıştır.

Bilginin bu kadar önemli olduğu yeni ekonomide, bilginin üreticisi ve araştırmacı olarak üniversitelerin, ekonomik gelişmeye katkı anlamında rollerinin geliştiği ve üniversitelerden beklentilerin arttığı görülmektedir. Hükümet politikaları, bilgi ekonomisinin gereklilikleri, üniversiteye atfedilen yeni fonksiyonlar üniversitelerin cevap vermesi gereken talepler haline gelmiştir. Bu durumda üniversiteler de diğer kurumlar gibi değişimler geçirmek durumundadırlar.

Üniversitelerde kurumsal değişimi zorunlu kılan en önemli itici güçler ise şöyle özetlenebilir: değişen ekonomik akımlar, bilginin ticarileşmesi, teknoloji transferinin artan önemi, bilgi ekonomisi; bölgesel gelişmenin artan önemi, refahı desteklemek,

ekonomik kalkınma, hükümet politikaları; bilgi merkezi olma, girişimci üniversite olma, işbirlikçi üniversite olma, yeni fonksiyonlar.

Çalışma kapsamında dünyadaki çeşitli hükümet politikalarıyla birlikte Türkiye'nin genel yapısı da incelenmiştir. Öncelikle Türkiye'nin genel durumu, yeni ekonomik gelişmelerin neresinde durduğu araştırılmıştır. Özellikle Türkiye'nin Dünya Ekonomik Forumu'nun, Küresel Rekabet Raporu'nda verimlilik odaklı ekonomiden yenilikçilik odaklı ekonomiye geçişine değinilmiştir. Ayrıca 2010-2011 döneminde Araştırma Geliştirme kapsamında Türk hükümetinin ve politikalarının adımları ve kurumsal yapıdaki değişimleri anlatılmıştır. Bu değişimlerden en önemlisi de Avrupa Birliği uyum yasaları kapsamında çıkarılan 5018 Sayılı Kamu Mali Yönetimi ve Kontrol Kanunu ile birlikte gelen tüm devlet kurumlarına stratejik plan yapma zorunluluğudur. Bu kanunla birlikte tüm devlet üniversitelerinin stratejik plan yapmas ve Strateji Geliştirme Daire Başkanlığı kurması gerekmektedir. Bu değişim Türkiye'deki en önemli kurumsal yapı değişimlerindendir.

Türkiye'nin dünyadaki yerini anlamak amacıyla, dünyadaki çeşitli üniversitelerin bilgi ekonomisi kapsamındaki değişimleri yapılan bu tez çalışmasında araştırılmıştır. Çalışma kapsamında dünyanın çeşitli yerlerindeki 15 üniversite yönetim yapısı, akademik yapı ve üretkenlik başlıkları altında incelenmiştir.

İstanbul'daki 4 Türk üniversitesi de İstanbul Teknik Üniversitesi, Boğaziçi Üniversitesi, Sabancı Üniversitesi, İstanbul Bilgi Üniversitesi örnek çalışması olarak seçilmiştir. İstanbul Teknik Üniversitesi ve Boğaziçi Üniversitesi köklü geçmişleriyle ve devlet üniversitesi sıfatıyla, Sabancı Üniversitesi ve Bilgi Üniversitesi ise yeni ve özel üniversite olmaları dolayısıyla seçilmişlerdir. Ayrıca her bir üniversite Türkiye'de önemli projelere ve yeniliklere imza atmışlardır. Bu üniversiteler yönetim yapısı, akademik yapı ve üretkenlik başlıkları altında incelenmişlerdir.

Birincil veriler kurumsal yönetim, araştırma geliştirme faaliyetleri, uygulama ve araştırma merkezleri, sanayi ile ilişkilerden sorumlu rektör yardımcıları ile yapılan mülakatlarla elde edilmiştir. İkincil veriler ise bu üniversitelerin veri tabanlarından, ilgili internet adreslerinden elde edilmiştir. Yeni stratejiler, gelişim yönleri, akademik yapılarındaki değişimler, araştırma geliştirme faaliyetleri, sanayi ile ilişkileri ve yeni kurulan birimler analiz edilmiştir.

Bilgi ekonomisinin üniversitelerden beklentisi, bölgesel gelişmede en önemli kurumlardan biri olmak; refah ve ekonomik kalkınmayı desteklemek; bu amaca ulaşabilmek adına bilgi üretimi; araştırma ve geliştirme faaliyetlerinde daha aktif olmak, üniversite yönetimini geliştirmek; teknoloji transfer etmek; uluslararası alanda başarılı olmak; sanayi, kamu kurumları, sivil toplum kuruluşları ve toplumla ilişkileri güçlendirmektir.

Çalışma kapsamında incelenen 4 üniversite de ilgili konu başlıklarında oldukça aktif eylemlerde bulunmaktadırlar. Kurulan teknoparklar ve açılan teknoloji transfer ofisleri bunun en somut örneklerindendir. 4 üniversite de bilgi ekonomisi kapsamında kurumsal değişimi tecrübe etmektedirler. Çalışma sonunda Türk üniversitelerinin de dünya üniversitelerindeki değişimlere paralel gelişmeler yaşadıkları sonucuna varılmıştır.

Son olarak altı çizilmesi gereken husus ise dünyadaki üniversitelerin kurumsal dönüşüm çalışmalarına 1970'li yıllarda başlamış olmalarıdır. Türkiye'de ise bu değişim 2010'dan sonra başlamıştır. Buna rağmen kısa sürede büyük adımlar atılmış

ve dünyadaki örneklerle uyumlu hale gelmişlerdir. Türk üniversiteleri zamanlama açısından geride olmasına rağmen bilgi tabanlı ekonominin önemli bir parçası olma konusunda daha yoğun ve bilinçli değişiklikler yapmışlardır.

1. INTRODUCTION

Thomas Stewart (1997) asserts that wealth is production of knowledge in modern times we live in. Knowledge became primary raw material and the most important product of the economy. Today, capital assets that are needed to create wealth are not land, physical labor, machine tools and factory. Knowledge had received their place. This process is that industrial society based on tangible capital is leaving its place to information society based on knowledge. Knowledge is recognized as a crucial element of economic growth in addition to physical capital and labor and for having success with sustainable development is possible with knowledge creation, knowledge flows, and the capitalization of knowledge (Mueller, 2005).

Since knowledge is critical and essential input for production, new parameters to define economic dynamics, need to arise. World has economical transitions which started with agricultural economy, then industrial economy, post-industrial economy. And today, the world keeps turning in a knowledge-based economy, which includes technology and human capital (Url-1).

The knowledge-based economy has become the major trend in international society in the 21st century (Hsu, et al., 2008). The knowledge-based economy has emerged with the some changes and it has led to some changes. Globalization, technological development such as the evolution of the Information and Communication Technologies, common use of the Internet, all of them are driving forces for knowledge-based economy. As a result of knowledge-based economy, knowledge production is becoming an important activity for economic development. R&D and creativity gain importance day by day. Human resources have a crucial role in the knowledge-based economy. Especially highly skilled labor is important for these new innovative and technological work area. Entrepreneurship is important to respond to technological change and need of innovative and creative actions. Need of structural and organizational change has emerged with the knowledge-based economy (Arundel, et al., 2008).

Competition and innovation conditions in today's world, force all actors in an economic environment. In the knowledge-based economy public authorities, universities, education sector, firms, organizations, all of them are considered together. According to Leydesdorrf (2009), with the evolution of knowledge economy, the importance of dynamic interconnections between the university, industry and government is increasing.

Knowledge-based economy requires specialization, research, innovation and learning to achieve a success in economic development and create wealth. To respond these requirements, the change towards a knowledge-based economy is happening on a global scale, a transformation is taking place in all advanced industrialized economies and many developing economies are also aspiring to reach this target (Schilirò, 2010). Within economies institutions whether public sector or private sector should transform to provide these requirements: current transformations in university-industry-government relations (Cooke and Leydesdorff, 2005), transferring knowledge, being innovative and flexible (Göransson and Brundenius, 2011). There is an institutional transition by means of knowledge economy. The diversification of the inputs in economic activities, the changes in production methods, the increasing importance of knowledge, and technological developments are forming the base of institutional transition. In fact, with all of these happenning, institutions are compelled to adopt their self to the new requirements and while doing this they should add value to the whole economy. Universities are one of the most important amongst the institutions.

1.1 The Aim of the Thesis

Since economy based on knowledge, universities are becoming more important and expectations from them are getting higher. Expected from the universities are having strong linkages and cooperation, being an entrepreneurial university, producing knowledge, having solid organizational structure (Göransson and Brundenius, 2011). Alongside these expectations, change becomes obligatory to survive and be an important part of economic development.

There is an expanded literature about institutional transition in universities from around the world by means of knowledge-based economy (Berns et al., 2007; Bokor, n.d.; Cooke and Leydesdorrf, 2005). Some changes are administrative, some of them

are academic, and some cases are about productivity of a university (Berns et al., 2007; Caniëls and Bosch, 2010; Goddard et al., 2012; Göransson and Brundenius, 2011; Hellström, 2007; Hudson, 2006). This thesis aims to comprehend the institutional transition by means of knowledge-based economy in general, transitions of universities is investigated deeply among institutions as an important part for innovation and knowledge and examine the transition in Turkish universities.

1.2 Main Hypothesis and Research Questions

Main hypothesis of the thesis is:

- There is a transition in universities by the means of knowledge-based economy.

Research questions are:

- How Turkish universities respond the expectations of knowledge-based economy?
- Where is the place of Turkish universities in the institutional change around the world that required by knowledge-based economy?
- Which are affected by this transition process, which affect this transition process in Turkish universities?

1.3 Methodology

Primarily a literature study about the knowledge-based economy was carried out. In order to analyze and assess the transition of Istanbul Technical University, Boğaziçi University, Sabancı University and Bilgi University primary and secondary data were used. For the purpose of understanding this transition in depth, deep interviews have been carried out with vice-rector of these universities, whom professionally are in charge of institutional management, R&D activities, research and application centers and industrial relations in their universities as primary data. As well as, secondary data was collected from universities' databases, database of TUBITAK and other related institutions.

Parallel with the world cases, 4 Turkish universities, which are in Istanbul, were investigated under the same angels. A mixture of old and new, public and private universities in Istanbul were selected to examine if there is a change in these

universities by the means of knowledge-based economy and further to examine how compliant was these changes with the similar world cases.

1.4 Structure of the Thesis

The Thesis consists of five sections. Introduction includes the aim, methodology, and main hypothesis and research questions. Chapter 2 involves the introduction of the knowledge-based economy, presentation of the major driving forces of the knowledge-based economy, overall examination of institutions, and institutional change. Also the main changes in the Turkish innovation policy and system were touched on.

In the Chapter 3, the importance that universities gain in the knowledge-based economy was elaborated, new roles of the university and the challenges that university is facing are described. Institutional transition in particular universities around the world by means of knowledge-based economy is reviewed. Some universities from the world were examined about their management, productivity and academic changes.

Chapter 4 is left for the case study. In this chapter strategic drivers, governance, academic structure, internationality, R&D activities, industry relations, technology transfer and sharing knowledge of 4 Turkish universities, which are Istanbul Technical University, Boğaziçi University, Sabancı University, Istanbul Bilgi University, were analyzed. Lastly, Chapter 5 concludes by highlighting what kind of changes were analyzed in Turkish universities and the points that showed similarities between Turkish universities and world cases.

2. KNOWLEDGE-BASED ECONOMY AND INSTITUTIONAL CHANGE

In traditional production labor, capital, materials and energy are important, besides knowledge and technology are external impacts on production. Today knowledge can be included straight in production, because analytical methods are being developed (OECD, 1996). Since knowledge is critical and essential input for production, new parameters to define economic dynamics, need to arise. Developed world has transitions in chronological order, agricultural economy, industrial economy, post-industrial/mass production economy and lastly knowledge-based economy that include technology and human capital (Url-1). Today economy is based on creating, evaluating and trading knowledge (Url-6).

2.1 Description and Drivers of Knowledge-Based Economy

Production and services are based on knowledge intensive activities, which provide technical and scientific advance in the knowledge economy. New technologies like the common use of personal computers, the widespread use of email and the Internet, forced the nature of work and the economy to change. These new technologies based on knowledge and information production and dissemination drives the economy in developed countries (Powell and Snellman, 2004).

In recent decades new research topics emerged such as what has changed and how these new trends can be harmonized with the economy. The question what has changed, can be answer with these following trends:

- Knowledge is increasingly considered to be a commodity,
- Information and Communication Technologies lower the costs of various aspects of knowledge activities,
- The degree of connectivity among knowledge agents has increased dramatically (Cowan and Paal, 2000).

2.1.1 Description of knowledge-based economy

In the light of new trends and technological developments, the basic definition of knowledge-based economy is coming like that: “The knowledge economy is the use of knowledge to generate tangible and intangible values. Technology helps to transform a part of human knowledge to machines. This knowledge can be used by decision support systems in various fields and generate economic values.” Knowledge-based economy has been marked by the upheavals in technological innovations and the globally competitive need for innovation with new products and processes that develop from the research community such as R&D factors, universities, labs, educational institutes (Url-1).

According to OECD Knowledge-Based Economy Report (1996), the new driver of productivity and economic growth was defined as knowledge. By this recognition a new focus raised about role of information, technology and learning in economic performance. The term “knowledge-based economy” stems from this fuller recognition of the place of knowledge and technology in modern OECD economies (OECD, 1996).

Followings are characteristics of a knowledge-based economy (Steinmueller, 2002, Smith, 2002, Foray, 2004, Powell and Snellman, 2004, Lundvall, 2004, Leydesdorff, 2006, Schilirò, 2010, Malaysia Perspective Plan, 2001):

- KBE has abundant resource. Knowledge input will be forever in economic life with technology and innovation.
- KBE has no barrier. Innovation in technology provides a wide access to resources and markets all over the world. Workers and capital mobility is increasing.
- KBE needs a highly educated labor force. Workers contribute to ideas, skills and knowledge by using latest technology.
- KBE needs universities and the higher education sector. Universities and the higher education sector are economic actors in attracting and retaining and as agents of diffusion and regeneration of knowledge, so in the knowledge-based economy it is more important than ever the role of knowledge institutions and the higher education sector as providers of human capital and drivers of innovation.
- KBE has a high level of per capita wealth. Knowledge-based investments

generate increasing returns to scale and therefore, more wealth for all.

- KBE is well connected to other global knowledge networks. Connectivity to the rest of the world and technology sharing as well as technology transformation will be made easy with the free flow of information with lower cost, and reliable infrastructure encourage information and technology sharing.
- KBE made a shift from top-down hierarchical organizational structures to flatter shared-structures such as networks of semi-autonomous teams. IT development and communications technology will lead to better interaction among workers and there will be active involvement of workers in contributing ideas and decision-making.
- In KBE, skills and knowledge are key assets. Skills and knowledge become the main assets for the economy to gain competitiveness.
- Information and communications technologies (ICTs) are pillars of the KBE. Access to networking is essential in acquiring and disseminating knowledge and the Internet is a key driver of ICT especially in the development of E-based activities, resulting in new approaches to doing things.
- KBE is a learning economy, where interactive learning is a key to economic performance of firms, regions and nations.
- KBE needs public investments to respond the demands of knowledge-based economy, especially support of science and technology, higher education, business and enterprise policies.

2.1.2 Drivers of knowledge-based economy

New important definitions and drivers for economic performance are arising. Such as information society with increasing communication and computer networks, learning economy with the need of workers to acquire a range of skills and to steady adapt these skills, and national innovation systems with the raising importance of knowledge and technology diffusion requires better understanding of knowledge networks are defined in knowledge-based economy (OECD, 1996).

In recent decades, a number of structural changes frequently described in terms such as globalization, the information age, and the rise of the knowledge-based economy are significantly transforming the way of getting, spreading and transforming of

knowledge. These changes around the world that influence business and national competitiveness, defines as driving forces of knowledge-based economy:

- Globalization: Today markets and products are more global.
- Information Technology: IT is related with information knowledge intensity, new media, computer networking and connectivity. Over 70% of workers in developed economies are information workers; many factory workers use their heads more than hands today. New media increases the production and distribution of knowledge, which in turn, results in collective intelligence. Developments such as the Internet help globalization (Url-1).

While living in the time of knowledge economy, how economic development can be achieved. Knowledge is a strategic factor for innovation and entrepreneurship, which are two important keystones in today's economy. In an open competitive economic system, knowledge spillovers and distribution are examined as important achievement factors for regional development. To be success in regional welfare creation knowledge policy is a crucial element for countries, since knowledge refers to education, learning, training, creativeness, and R&D (Capello and Nijkamp, 2011).

For building a knowledge economy, countries should provide information infrastructure, quality higher education, quality research and development, innovation, entrepreneurship, proper economic institutions. Lohani (2013) points out that: "An educated and skilled workforce is critical, and poses a challenge in a region. Investing in institutions, strengthening university-industry links and promoting cross-border institutional partnerships can create greater opportunities" (Url-3).

To sum up there are 5 main drivers for knowledge-based economy, which bring together success and creating wealth for economies around the world:

i) ICT investment and use is very important. The influence of ICT production and diffusion on opening up new areas of investment and increasing productivity growth. ICT is important with innovation, science, and technology. These are central features and a cause of increases in economic growth and productivity.

ii) Human resources have a crucial role in knowledge-based economy. Especially highly skilled labor is important for these new innovative and technological work area.

iii) Knowledge production is another driver for economy today. R&D and creativity gain importance day by day.

iv) Entrepreneurship is important to respond to technological change and need of innovative and creative actions.

v) Need of structural and organizational change has emerged. Organizational innovation is also important to survive in this competitive environment. Every public and private institution provides solutions and gets policy support for the implementation of the challenges of increasing globalization. Change is emphasized, resulting in a reconfiguration of economic, social and political relationships (Room, 2004, Workpackage1, 2008, OECD, 1996, Schilirò, 2010, Sabau, 2010)

With the development of knowledge-based economy, there are some changes in the perception of economic terms and inputs. Increasing demand for more high skilled workers identifies employment in the knowledge-based economy. Educated and skilled labor is getting more valuable for economic life because of changes in technology and occurrence of information technologies. This means, demand from higher education institutions is increase more and more. Along with the changes in aspects of employment, knowledge intensive service sectors gain importance such as education, communications and information, and they are growing faster compared to other sectors.

Producing knowledge and science system is another issue for the knowledge-based economy. Fundamentally research laboratories and institutes of higher education are the key factors in the knowledge-based economy with their knowledge production, transmission and transfer. A new role definition is made for these institutions, which is collaborating with industry in the transfer of knowledge and technology (OECD, 1996).

2.2 Institutions in Knowledge-Based Economy

North (1990) made definition of institutions as: "Institutions are the rules of the game in a society or, more formally are the humanly devised constraints that shape human interaction. In consequence they structure incentives in human exchange, whether political, social, or economic."

Both public and private institutions have important role in the economy. In the knowledge-based economy public authorities, universities, education sector, firms, organizations, all of them are considered together. The relationship between these institutions ensures the development of knowledge and technology, transferring them and increasing innovation performance in a region (OECD, 1996). Since knowledge-based economy requires success in education and training, innovation, information structure, and institutions the role of institutions are becoming more important. In this sense relationship between them and transforming themselves in accordance with the requirements of the day is substantial for economic development (Schilirò, 2010).

Governments, public authorities, higher education institutions, firms, SMEs all of them are important for economic life. Governments are policy makers. In the 21st century, the urgent task for governments is considering the driving forces of the knowledge-based economy and making policies to increase innovations. Governments play a leading role in this age of the knowledge-based economy. "Government policies, particularly those relating to science and technology, industry and education, will need a new emphasis in knowledge-based economies. Acknowledgement is needed of the central role of the firm, the importance of national innovation systems and the requirements for infrastructures and incentives, which encourage investments in research and training" (OECD, 1996). Policies and trend scenarios for a knowledge-based economy should support supplying of scientists and engineers, innovation demand, and environmental innovation (Cowan and Paal, 2000).

Higher education institutions are one of the most important institutions in the knowledge-based economy. Universities and other research institutions impact the economic activities since their establishment. In recent decades, the knowledge became an essential component of modern economy; university has become

headstone of the innovation system in a nation as a result of its production of human capital, knowledge and entrepreneurial activities (Göransson, Brundenius, 2011). Research and development activities and education for high-skilled workforce are extremely important. Because, education increases the quality of labor and human capital, at the same time R&D increases the quality of machines and physical capital (Kumar and Welsum, 2013).

Industrial institutions, firms provide employment for human capital, and they are main value producer from knowledge, which came from itself, universities and human capital. Continuation of training and lifelong learning are the issues happening in firms and industries.

Naturally, university-industry-government collaboration is very crucial for knowledge-based economy. This collaboration provides the diffusion of new technologies to a wide variety of sectors and firms, and facilitating the development of information infrastructures.

The demand from institutions is different today. In the knowledge-based economy, investment in knowledge is vital for every institution. In this new economic environment, high creative capacity, innovative structure, generating and exploiting new ideas, applying technology and promoting superior entrepreneurial skills are expected from institutions (Malaysia Perspective Plan, 2001).

2.3 Institutional Transition in Knowledge-Based Economy

Capello and Nijkamp (2009) point out that: "The rise of knowledge economy in recent years, and its predominant spatial location in number of dynamic regional economies in north America, Europe and Asia, offers such a context of major technical and market evolution and the consequent modification in the nature and structure of incentives for economic actors – a fertile ground for the reform and evolution of new institutions."

Innovation and change are basic requirements in this era of the knowledge-based economy. Economic activities have a new meaning of value through innovation. In this sense all institutions should increase their productivity by means of knowledge (Hsu, et al., 2008). While technological developments have a heavy increase, globalization provides an open competitive world, use of the Internet is so common;

institutions must adapt this new system. These challenges have put pressures on the institutions and the way governments work. As Schilirò (2010) states that: "So institutions have to gear themselves up to respond to these changes in the market, and governments must also devise new and appropriate policies. At the same time organizational changes need to be introduced, processes have to be improved and strengthened to cope with increasing competition, while this increasing competition, in turn, call for improved co-ordination between institutions." All sectors of economy are intended as institutions: manufacturing and services, high tech and low tech, domestic and internationally traded, public and private, large corporation and small enterprises.

In this age, the main driver of growth, wealth creation and employment is the interference with knowledge and computer technology (APEC, 2000). Consequently, institutions have forced to reinvent themselves and build systematic practices for managing self-transformation (Sabau, 2010). Schilirò (2010) points out that: "Various institutional changes must be introduced and these institutional changes that need to be made will involve the public and private sector. In addition, because of the difficulties for the institutions to build and establish itself over time, it is necessary a certain degree of flexibility in the institutional regime and, hence, the ability to respond to uncertainties."

In this new economic environment, high creative capacity, innovative structure, generating and exploiting new ideas, applying technology and promoting superior entrepreneurial skills are expected from institutions (Malaysia Perspective Plan, 2001). Independently, the dynamics of innovation can change institutions. Lam (2000) states that: "In a knowledge-based economy, one expects interaction terms among the functions and the institutional carriers of these functions. The layers of functionality and institutionalization may couple vertically as when there is a correspondence between functions and the carrying institutions or horizontally as in university-industry-government relations. Both interactions can be relevant for the innovative reorganization of a system."

In this new economic environment, "governments are offering incentives, on the one hand, and pressing academic institutions, on the other, to go beyond performing the traditional functions of cultural memory, education and research, and make a more direct contribution to wealth creation" (Etzkowitz and Leydesdorff, 2000).

Governments are also shifting their relationships to economic institutions. Governments' regional policies are changing through being innovative. For example the EU innovation policy says that: "Transforming European research outcomes into new and better services and products is necessary to remain competitive on the global marketplace and improve the quality of life in Europe. For this reason, innovation is a cornerstone of the European policy to improve competitiveness and tackle societal challenges" (Url-5). Likewise in China, "The Chinese leadership is trying to upgrade Chinese innovative capabilities; Beijing has set clear objectives to promote indigenous innovations with the recently approved 12th Five Year Plan (2011-2015), which calls for bolder steps in reform and innovation" (Url-4).

These are some examples for the policy changes and actions according to these policies. Meanwhile the role of higher education institutions is changed as well. With the knowledge-based economy, the human capital, which contributes to society through knowledge creation and applications, has a great value for economy (Url-2). According to Reif (2014), the President of the Massachusetts Institute of Technology: "Today universities are involved in the creation of new knowledge may be seen as a by-product or joint product of their educational mission. In practice, the educational mission of universities shapes their approach to conducting research through the assignment of important research roles for students and their participation in technical activities."

In this changing world, universities are also in transition. In addition to universities' teaching task, today universities try to transfer innovative researches to industry to benefit the national economy and society (Url-2).

Another changing institution is firms. Firms have structural and organizational change due to organizational innovation and the impact of the internationalization of production and knowledge generation. Current studies identify three main types of organizational change in a firm to survive which are related to:

1. Workplace organization (just in time, quality management, team working, flatter organizations etc.),
2. Business practices (knowledge management systems, education and training etc.),
3. External relations (outsourcing, networking) (Arundel et al., 2008).

2.3.1 Situation in Turkey

Turkey is an economy in transition from efficiency driven economy to innovation driven economy according to the Global Competitiveness Report prepared by World Economic Forum in 2013. Brief definition of efficiency driven economy and innovation driven economy is as follow: "In efficiency-driven economies, government focus is on ensuring smooth mechanisms such as a proper functioning of the market; higher education systems, goods and labor markets and technological readiness. In innovation-driven economies, entrepreneurial framework conditions become more important as levers of economic development than basic requirements or efficiency enhancers. The outcome of the model is national economic growth through, for example, job creation and technical innovation" (Url-14). In a word, entrepreneurship, research and development activities, innovation are becoming more important in Turkey day by day.

In Turkey, government funding for R&D and innovation activities continues to increase. In the 2010-2011 period, the following main changes occurred in the Turkish innovation policy and system:

- The new Science, Technology and Innovation Strategy, covering the period 2011-2016 was approved by the Supreme Council of Science and Technology (BTYK). The strategy aims to create more output from existing research capacity and enhance needs-oriented research capacity.
- The SME Strategy and Action Plan was issued. The plan identifies the 'enhancement of R&D and innovation capacities of SMEs' as one of five strategic focus areas.
- The Government replaced the existing Ministry of Industry and Trade with a new Ministry of Science, Industry and Technology (MoSIT). All main actors in the system, including the Scientific and Technological Research Council of Turkey (TUBITAK) and the Turkish Academy of Science, are connected to the MoSIT.
- In June 2011, the Ministry of Development and the Ministry of Economy were established.

Table 2.1: 2023 R&D targets in Turkey (Url-16, Url-17).

	The average of the top 15 countries that have the highest share of R&D expenditures in GDP	**Turkey (2010)**	**Turkey – 2023 Target**
R&D Expenditure Share in GDP	3,03	0,84	3,00
R&D Expenditure of Private Sector in GDP	2,10	0,36	2,00
R&D Expenditure per FTE Researcher	220.000 PPP $	150.000 TL	280.000 TL
Number of FTE Researcher	233.703	64.341	300.000
Number of FTE Researcher in Private Sector	167.000	25.342	180.000
The Ratio of FTE Researchers in Private Sector to total FTE Researchers	58,3	39,4	60,0

In the TUBITAK 2023 Targets the main aim of Turkey is becoming one of the world's 10 largest economies (Url-15). Turkey as a country with economy in transition to innovation driven, give importance to R&D and innovation activities. Government of Turkey set targets to increase R&D expenditure share in GDP 3,5 times and number of FTE researchers 4,6 times (Table 2.1). Turkey's target values are equivalent with the average values of the top 15 countries R&D expenditure share in GDP in 2009.

Table 2.2: R&D activities in Turkey (Url-18).

Number of Scientific Publication in 2008		**Number of Patent in 2008**		**Number of Patents per 1000 Scientific Publications in 2008**	
USA	275.000	USA	231.588	Japan	1.298
China	120.000	Japan	82.399	USA	842
Japan	65.000	South Korea	23.554	South Korea	799
South Korea	29.500	Israel	4.550	Israel	506
Turkey	**18.000**	China	4.445	Switzerland	279
Switzerland	12.000	Switzerland	3.335	China	37
Israel	9.000	**Turkey**	**85**	**Turkey**	**5**

Considering the return of the increased R&D investments in Turkey, it can be seen that despite the number of scientific publications are increasing rapidly, industrial applications are less and the relationship between scientific publications and patent numbers are weak (Table 2.2). There are some problems in the conversion of scientific achievements to technological innovation and utility model. In this context universities have great responsibility to build strong R&D collaborations.

In addition to main changes in the Turkish innovation policy and system in the 2010-2011 period, there was an important structural transition for Turkish public institutions in 2006. In 1990s, the change in terms of management approaches has accelerated. Reconstruction works in the public sector is advancing under the influence of "New Public Management" understanding. Unlike the old understanding of public administration, "new public management" brings out differences. This new public institutions are participatory, transparent, effective and efficient accountability, pro-active and future-oriented, determined performance criteria and standards, objectives and outcomes-oriented, seeing citizen as a customer. These

concepts form the new management understanding of public institutions and universities in Turkey (Kahraman, 2012).

Many developed countries have gone to significant structural changes in public financial management and budgeting system. At the end of 1980s New Zealand and Australia, in the 1990s Sweden, USA, Finland, England, Denmark, the Netherlands, Canada and France, at the beginning of the 2000s Austria, Switzerland and Germany have made arrangements about transition in performance based budgeting (Hastürk, 2012).

In parallel with these developments in the field of public financial management around the world; also in Turkey the transition to strategic planning and performance-based budgeting has been envisaged in order to use public resources effectively, efficiently and economically, target financial discipline, accountability and financial transparency with the law no. 5018 Public Financial Management and Control that was prepared under public financial reforms. The law no. 5018 Public Financial Management and Control, which brings drastic changes in public financial management system, came into force and began to be implemented with all aspects as of the date of 01.01.2006 (Öztürk and Uzun, 2011). According to the law, every public institution was obligated to prepare strategic plan.

After the law every public university was obligated to establish the Department of Strategy Development. This Department in universities is on duty and use authority based on the law and regulations (Aktan, 2007). This step is very important for the university governance since the university set vision, mission and values, identify strategic goals and objectives, autonomy and responsibility, resource use and distribution, cooperation with stakeholders. This is an important factor for universities to gain success.

As Capello and Nijkamp (2009) states that "institutions evolve, both formally and informally, and will continue to influence the rate at which different regions develop and the ways in which development occurs." Institutions, governments, nations, even people have changed to respond the needs in the modern, knowledge-based society.

This chapter basically explained description and drivers of knowledge-based economy and to respond technological development and drivers of knowledge-based economy the transition in institutions were represented. Next chapter illustrated importance of university as an institution in knowledge-based economy and transition of university.

3. TRANSITION OF UNIVERSITIES IN KNOWLEDGE-BASED ECONOMY

The introduction of the knowledge-based economy, presentation of the major driving forces of the knowledge-based economy, overall examination of institutions, and brief investigation of these institutions' change were explained in Chapter 2. Among other institutions, universities have an extremely important place in the knowledge-based economy. As such, the aim of Chapter 3 is reviewing the literature that the importance universities gain in the knowledge based economy, universities' new roles, the challenges that universities are facing and university transition examples from all around the world.

3.1 The Role of Universities in Knowledge-Based Economy

Science is so important for every step of life and every step of knowledge-based economy, as Göransson and Brundenius (2011) note that: "It is pointed out in different models that science is a global institution, playing an increasingly important role in almost all societies in the world. Science is having an impact on environmental protection, economic development, social rationalization, etc." As science is so important for every step of life, the importance of universities as producer and cradle of science is an undeniable fact. Actually universities play important roles for society since medieval age, however lately universities are adding new roles to their institutional structure. "Since the 1980s, a large number of studies have examined the effects of research and higher education for the economic growth of industries, towns, regions and countries" (Westlund, 2004).

Mueller (2005) states that along with physical capital and labor, economists are conscious of knowledge as an essential factor of economic growth. Knowledge can be shaped as using for products and value of knowledge can be increased commercially. To success with increasing value of knowledge, existing knowledge stock and capacity of actors like employees at firms and researchers at universities are keystones.

In today's world, many natures from the form of production to consumption habits, social structures, and requirements show a change. Brainpower has started to take place of manpower. Being innovative, reading the needs of system and answering these needs in a suitable way are a challenge for all kinds of institutions. Besides, accessibility is becoming much easier with technological advancements, so it brings together with internationalization. It feels like there are no boundaries around the world. As a consequence of all these and mentioned changes, there will be transitions of structures, technologies and personnel of institutions. Today university is one the most important institution beyond others with its role, being source of the innovation and knowledge requirement.

According to Hudson (2006), human capital and economic success can be provided by a strategic resource that is education. "There is pressure on regions become learning or knowledge-creating communities, focusing on continuous improvement, production of new ideas, organizational learning, and transference of knowledge in order to promote regional growth and welfare" (Hudson, 2006). In this case, there is another pressure on universities increase support for economic growth. "When knowledge becomes the most important driver of economies, both the educational and the research functions of universities must be brought more strongly to bear on the private sector" (Mazza et al., 2008).

Additionally, the concept of knowledge is changed as bringing profit and being linked to economic growth directly in the era of the knowledge economy (Chen, 2012). This understanding knowledge with the knowledge economy is raising new awareness for linking knowledge to production. Mowery and Sampat (2004) point out universities influence to modern knowledge economy as fund of basic knowledge and technology that related with industry. From 1970s governments aware of this fact started to set institutions for strengthening the relationship between universities and industry. These institutions are "science parks", "business incubators", "public seed capital funds" and other organizations for linking universities to industrial innovation. It is a win or lose situation for universities that "the relationship between knowledge and wealth has been significantly highlighted, tightened, and materialized in the current knowledge economy" (Chen, 2012).

In the light of the literature, university is a bridge between the government, local authorities and industry, firms and labor. “The global knowledge system should be linked to local conditions if it is to play a role in the development process. Ideally, universities function as a bridge between global flows and science and technology on the one hand, and local conditions for economic development on the other” (Göransson, B., Brundenius, C., 2011). Once again, the importance of transferring technology, ideas, and knowledge to wide groups of users in society, including public departments and nongovernmental organizations emerges. At the same time, graduates from universities bring knowledge into firms; faculties provide knowledge on a consultancy basis; and industries, as well as public sector actors, consume scientific publications in their respective domains of activity (Bozeman, 2000).

3.2 Contribution of Universities to Economic Development

Goldstein (2009) puts in order the functions within universities that lead to economic development impacts as below:

- Development of human capital (teaching)
- Creation of knowledge (research)
- Transfer of existing know-how (technical assistance)
- Technological innovation
- Capital investment
- Regional leadership and governance
- Co-production of knowledge infrastructure and creative milieu.

With all of these activities and functions, universities occupy an important position in this competitive, innovative world. It should come, as no surprise that universities importance is increasing, on account of knowledge commercialized and knowledge production become the most important output for economies rather than goods production. There is another indicator for the value of universities coming from Westlund (2004); “The growing role of knowledge as the base of the economy has meant growing expectations of universities all over the world to function as engines for regional growth”. Throughout this process, university became a multiple institution with adding research, relations with industry, with public institutions and with society to its main education purpose. Göransson and Brundenius (2011) want to draw attention the importance of the relationship between global knowledge

system and local conditions to ensure development and in the direction of this purpose universities role as a provider this link between global flows, science, technology and local conditions for economic development. Today, it is not enough for a university giving youth an opportunity to have a profession or creating educated labor.

Most of researchers accept that today, governments' awareness about universities role in the reproduction and adaptation of human resources and the production of social capital and their policies to make universities more active as a regional stakeholder. For example, in the UK universities are considered to be "central to the new ways of working upon which local and regional partnership approaches to governance are predicted" (Charles and Benneworth, 2001).

The importance of the universities can be summarized with Swenson's (2012) opinions: "A university's presence in a region or a university system in a state may exert considerable influence on educational opportunities, cultural options, recreational choices, and the tone and tenor of regional economic vitality. Universities are large, they employ many people, they serve even more people, and they are directly and indirectly responsible for substantial fractions of regional incomes. A university influences the types of businesses in an area, housing values, the availability of area goods and services, and private and public infrastructure investments. In short, most universities have large and lasting economic and social footprints".

3.3 Transition of Universities

Since the knowledge became an essential component of modern economy, university has become headstone of the innovation system in a nation as a result of its production of human capital and entrepreneurial activities (Göransson, Brundenius, 2011). With governmental policies the main role of universities is changing by "human capital formation, knowledge dispersion, innovation systems, triple helix, etc". One example of this is in Sweden which legislated in 1997 that, in addition to education and research, the universities also have a third equally important task, namely to cooperate other parts of society (Westlund, 2004). First of all, university could not resist the changing order from governmental policies. And second there is a demand change for knowledge by society that they use technology in a greedy way.

As Rutten and Boekema (2004) state that universities should adapt this demand changes. Arnold et al. (2006), point out new needs in society, which are raising demands for health and welfare, environmental concerns, forces university to be related to the all current issues. Technological opportunities increase pressures on the universities to modernize.

Youtie and Shapira (2008) suggest a third model of the university has become apparent in recent decades such as adding university a new function being a "knowledge hub" that seeks to inspire indigenous development, new capabilities, and innovation especially within its region. Of course they are added this function to main functions of the modern university, which are training students and conducting research to produce new knowledge (Shapira and Youtie, 2004).

Table 3.1 : Evolving university contexts and missions, adapted from Shapira and Youtie (2008).

	Description of university	Economic context of university	Mission of university
1. Traditional	Storehouse of knowledge	Craft production	University is clerical or elitist "above society"
2. Present	Knowledge factory	Industrial mass production	University is "supplier" of inputs and outputs, a technology developer
3. Evolving	"Knowledge hub"	Post-industrial age, knowledge-driven	University is an integrated institution in an intelligent region, promotes indigenous development, new capabilities

University seeks to use knowledge to promote indigenous development and new capabilities in its region and beyond. Youtie and Shapira (2008) present forces that cause a transition and evolution of university roles (Table 3.1). These forces are "the underlying shifts in advanced economies away from traditional mass production and linear transfer relationships to post-industrial, knowledge-driven, open, and more interactive innovation systems" (Florida, 1995; OECD, 1996; Chesbrough, 2003).

In the process of adaptation to the new economic world, universities should reorganize research, evolve educational missions and methods, and reconsider developing and exchanging knowledge. Like in Sweden related to this new environment, in the US, "state governments (which operate large public university systems and fund teaching) increasingly request that their institutions foster economic development and innovation within their localities". With Bayh-Dole and University and Small Business Patent Procedures Act of 1980, federal policy encourages university technology transfer (Youtie and Shapira, 2008).

Gumport (2000) states the idea of higher education as an industry, which is moving toward recently. From this perspective, universities are becoming as a sector of the economy and expectation from university is transforming through expectations from firms or businesses as cooperating model of production to produce and sell goods and services, training some of the workforce, advancing economic development, and performing research. There is a wide research field and interest in different disciplinary domains about adding value to knowledge, transfer of technology, increasing university cooperation, the standardization of curricula and degree programs. In consequence of the changing role of the university in society, and evolution of academic science production, there are forces to change present organization" (Mazza et al., 2008).

3.3.1 Dynamics of university transition

There are external and internal dynamics that push university into a changing position. According to the study of Göransson and Brundenius (2011), firstly external dynamic is that universities and research institutions within the general economic and social context, and their role in national and regional innovation systems. Governments' policies are the example as an external dynamic. Expected from the universities are having strong linkages and cooperation, being an

entrepreneurial university, producing knowledge, having solid organizational structure. On account of knowledge-based economy, all partners of economy in a country or in a region should work together for sustainable development.

Governments, countries, unions are making policies about the changing role of universities due to ensure sustainable economic development. These issues cover an extensive place in their agenda and they emphasize the importance of the issue for the future of countries. For instance, the European Union (EU) set in Lisbon in 2000 the goal of being the leading knowledge-based economy in the world by 2010 (European Parliament, 2000). According to achieve that goal 3% of GDP would be invested in R&D. In 2006 in EU an essential task was seen in the reform of universities. With this reform, the EU and national governments place great expectations upon universities (Mazza et al., 2008).

Between the years 1998 and 2010, China recognized the value of knowledge in the knowledge economy and there was the expansion of higher education. Following the Asian Economic Crisis in 1997, Chinese leaders recognized knowledge production and transfer of knowledge as a crucial source of economic growth and wealth creation (Chen, 2012). Under a new national strategic project, Peking University and Tsinghua University were given extra resources to turn themselves into research-intensive universities in 1998. In 1999, higher education enrollment was increased by 50% by Ministry of Education.

In 1999, the French government commenced the "Innovation Act" due to support academic institutions to protect and commercialize their scientists' inventions. In the wake of the Act, "French academic institutions increased their propensity to claim Intellectual Property Rights (IPRs) over their employees' inventions, mainly under the form of co-ownership with business companies. This result varies with the technological class of the patent, the presence and age of a technology transfer office within the university, and the university size and type" (Malva et al., 2011). Consequently, university role is changed and university is encouraged and supported financially to increase their participation in economy by governments around the world. Here it is another expectation from universities.

Secondly, internal dynamics in the study of Göransson and Brundenius (2011) are:

- Organizational structures, the balance and connections between research and teaching
- Funding, the interaction between local, national, and international funding streams
- Management structures
- Extension activities of the university in its relations with the surrounding society

According to literature review, governments at the first place encourage this changing process, then other internal forces comes.

3.3.2 Drivers of university transition

Prytula and Umpleby (2005) state that the transition extended academic institutions lately, after transition started in the economy in the early 1990s. There are changes in the organizations of higher education in countries. Economy requires changes in the labor market and education; therefore some trends have occurred, which causes change in higher education in all countries. These trends can be put in order as following:

- The Internet links faculty members located in different regions or countries.
- The Internet makes amounts of information quickly available.
- A shortage of funds for higher education in many countries is leading universities to charge tuition and to establish endowments. Both of these trends will make universities more sensitive to the concerns and opinions of students.
- The Bologna process in Europe (Turkey also has Bologna process) is causing universities to establish common procedures for courses and degrees to make it easier to transfer credits and for students and faculty members to study or teach at other universities.
- Increasing use of English as an international language is facilitating the sharing of ideas.
- Quality improvement methods, which have been successful in business and government, are increasingly being used to improve the management of universities.

- Participatory teaching methods are becoming increasingly common. These methods encourage initiative and critical thinking rather than memorization.
- Service learning as a type of education makes universities more helpful to their surrounding communities and acquaints students with practical problems in organizations and society.
- The trend toward a knowledge society and economy is sending increasing numbers of people back to universities for further education.
- Distance education technologies make higher education available to people in their homes or work places (Prytula, Umpleby, 2005).

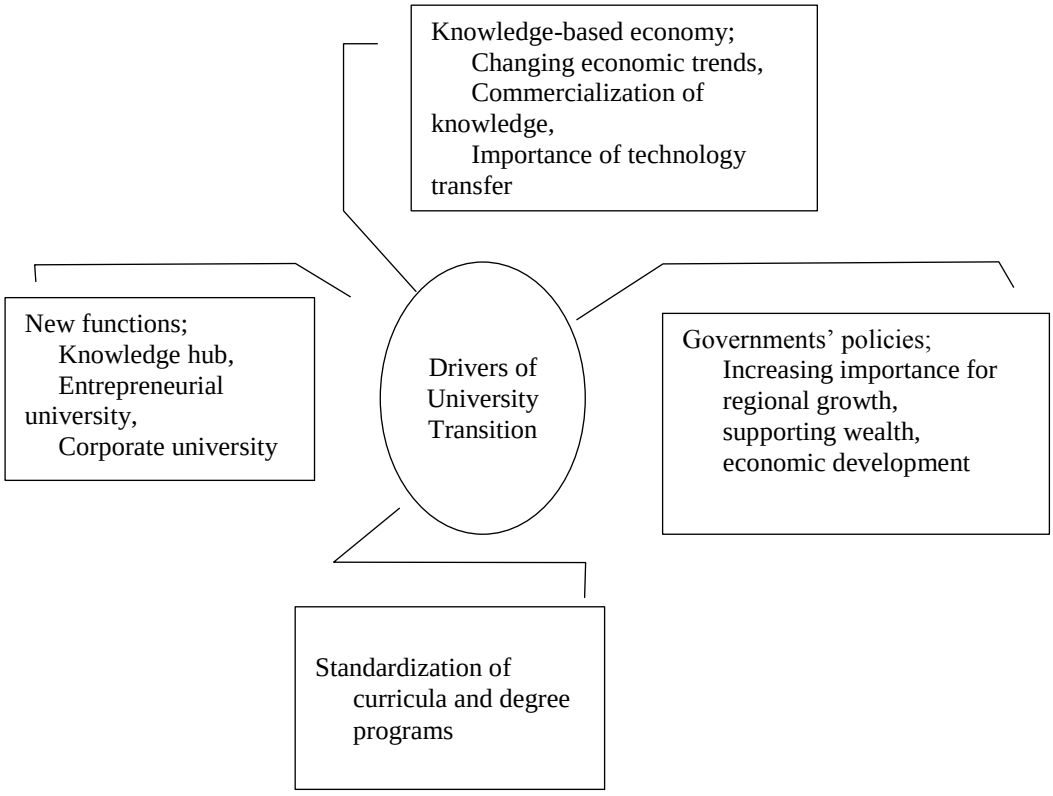

Figure 3.1 : Drivers of university transition, adapted from Bokor (n.d.).

Alongside these shifts (Figure 3.1), change becomes obligatory to survive and be an important part of economic development. Universities should reorganize research to catch up new evolvements in technology that require interdisciplinary and collaboration, should develop educational missions and methods supplying demands for new qualities in human capital, should re-evaluate the way developing and exchanging knowledge with their knowledge-based interactions and networks with industries and communities (Youtie and Shapira, 2008).

To sum up all dynamics and challenges that put universities in a changing position, following reasons could be stated:

- Changing economic trends, knowledge-based economy, commercialization of knowledge,
- Governments' policies about changing university role,
- Being one of the most important institution for regional growth, supporting wealth and economic development,
- Newly defined activities, functions for university for example, "knowledge hub", "entrepreneurial university", "corporate university" etc.,
- New mission for university to be a bridge between firms, public organization and society,
- Obligation to promote main duties coming from past, to be competitive,
- The importance of technology transfer, to success transferring technology building new units for example technology transfer offices,
- Standardization of curricula and degree programs around the world for example Bologna Process.

After all university should respond all that demands as an important institution. The change is required. Universities from all over the world, try to re-invent themselves in different ways so as to better survive in their changing environment.

3.4 World Cases of University Transition

Today, universities should compete in different cases. University competes for students, for research activity, for staff, for interaction with industry, for interaction with other countries, for being international in many ways. And also Gumport (2000) points out: "Universities are seen as competitors in the commercial activities of publication and copyrights, patents and licenses, positioning themselves and the nation for global competitiveness". According to Youtie and Shapira (2008), many universities work on a transition to be knowledge-hub and thus they are going to have a greater impact in regional innovation.

In real life, how universities respond to these demands in practice. Transition in universities is an issue highlighted even in national policies. Actually story began with the changes in national strategies to have a sustainable development. There is an

extensive literature about universities in transition. These studies can be found as a specific university in a region or all universities in a region or in a country, which change different ways. There are some examples of transition in universities in different ways. After reviewing these examples, collected information was helped to ask questions to the vice-rectors in the case study.

The literature review identifies the following actions that universities do to compete and translate (Youtie and Shapira, 2000; Chen, 2012; Arnold et al., 2006):

1. Universities develop more proactive strategies for becoming an important part of economic development,
2. Universities start to focus on research and knowledge creation more than ever,
3. Universities promote the linkage with industry by technology transfer, innovations, improving its identity as "knowledge-hub",
4. Universities increase cooperation not only with industry but also public institutions, non-governmental organizations, society, local producers and SMEs,
5. Universities enlarge their interdisciplinary activities and collaborations to reorganize research with using new developments in technology,
6. Universities evolve their educational missions and methods, realize the importance of graduates as labor force to meet demands for new qualities in human capital development,
7. Universities reconsider the ways in which they develop and exchange knowledge including their knowledge-based interactions and networks with industries and communities,
8. Universities standardize their curricula and degree programs to be accredited with other countries and international exchange programs,
9. Universities form alliances, exchange staff and students, join international groups, and cooperate actively.

University transition is about further participating economic development, for better relations with industry, for promoting quality of teaching, for promoting quality of labor etc. There are numerous changing cases in different universities from around the world.

Management changes, academic changes and changes for increasing productivity of

university occur under the university transition. In the light of the literature review these main changes are characterized by the actions (Table 3.2).

Table 3.2 : Actions for university transition, adapted from Youtie and Shapira (2000), Chen (2012), Arnold et al. (2006).

Management	- Develop more proactive strategies to be a strong part of economic development - Try to be less bureaucratic and more flexible and transparent - Work to be a world-class university - Evolve their educational missions and methods - Form alliances, exchange staff and students, join international groups, and cooperate actively - Create a knowledge-hub
Academic	- Standardize curricula and degree programs for being international - Promote academic staff's quality - Catch technological developments in teaching and research
Productivity	- Focus on research and knowledge creation - Promote the linkage with industry - Promote the relations with public institutions, non-governmental organizations, and society with courses, social responsibility projects etc. - Enlarge interdisciplinary activities and collaborations by encouraging - Develop and exchange knowledge with opening new units like Technopark, Technology Transfer Offices etc. - Realize the importance of graduates as labor force to meet demands for new qualities in human capital development

University has transition for further participating economic development, for better relations with industry, for promoting quality of teaching, for promoting quality of labor etc. In the literature, there are examples from universities, which practiced and are continuing practice these changes.

Management decisions in the university are the crucial action for transition in the university. Actually, everything starts with strategies, vision and mission of a university.

Today, universities develop more proactive strategies and missions to be a strong part of economic development. In the year 2000, Newcastle University introduced a new mission: "To be a world class research intensive university, delivering teaching of the highest quality and playing leading role in economic, social and cultural development of the region" (Goddard et al., 2012). Another example is La Trobe University. In the University 2009-2012 Strategic Plan, Vice Chancellor and

President of the University, Professor Paul Johnson points out that: “La Trobe intends to make a greater contribution to the social, economic, cultural and environmental outcomes for regional communities” (La Trobe University, 2008). Additionally, University of Manchester sets three core goals for world-class research university and for increasing the total research income to 60% by 2020, in the University 2020 Strategic Plan (Manchester, n.d.).

Universities try to create a knowledge hub to advance technological innovation and economic development in its regions just like the case of Georgia Institute of Technology. In 1994, the university opened new research and academic buildings to reach that goal, and the university management opened 5 institutions as university-centered knowledge-hub initiatives:

1. The Georgia Research Alliance (GRA) was formed in 1990 as a collaborative research initiative.
2. The Yamacraw Initiative was a state initiative launched as a 5-year project in 1999 to make Georgia a world leader in the design and commercialization of high-capacity broadband communications systems, devices, and system-on-a-chip technologies. Georgia Tech. emerged as central player in this project.
3. The Advanced Technology Development Center established at Georgia Tech. in 1980 to offer entrepreneurial services including space, guidance, and support for early-stage new technological companies.
4. VentureLab was created in 2001 to improve the success rates of finding and commercializing spinoffs from Georgia Tech faculty research.
5. Georgia Centers of Innovation was created in 2003 with a new focus to serve a mediating role between industry and university researchers, linking them to work on critical competitiveness problems of the pulp and paper, food processing, and textiles and carpet industries (Youtie and Shapira, 2008; Url-7).

There are academic changes in universities to support these changing strategies and missions of universities. One of these actions is standardizing curricula and degree programs for being international. To be a world-class university or to be known around the world is becoming more important for universities. To answer the demand of standardization of curricula and degree programs, the Technical University of Berlin introduced an integrated Bachelor and Master degree program in

the context of the "Bologna Accords" (Url-8). In the England Government's White Paper "Higher education: students at the heart of the system" (Department for Business, Innovation and Skills, 2011), there is a reform agenda. According to this reform agenda, the University of Glasgow has developed a strong international strategy as in recent times internationalization has become a strategic priority. Its focus is on building Glasgow's reputation in key markets and making the University truly international. An organization structure has been in place since 2008 to support these ambitions, with a number of International Deans who lead on delivering the partnership strategy. A number of strategic partnerships have been developed, for instance with Columbia University in New York (Knight and Holbeche, 2012). Another example is the University of Leuven. Like all universities, KUL has to respond to internationalization in education and research. KUL intends to change its policy with regard to new appointments and remunerations. International experience will become a recruitment requirement. Additional internal funding will be made available to attract international talent. In addition, KUL has entered into many bilateral international relationships (Arnold et al., 2006). In the University of Manchester 2020 Strategic Plan, the 6th Enabling strategy is being an international institution. The University of Manchester has a strong international profile and is already a highly internationalized university, with 25% of its students from outside the UK; 25% of its academic staff from outside the UK; 25% of its research publications co-authored with non-UK collaborators; and more than 250,000 alumni around the globe (Knight and Holbeche, 2012; Manchester, n.d.). Also Georgia Institute of Technology starts new internet-based degree programs, joint degree programs with another university, and international campus based programs including in France, Singapore and China (Youtie and Shapira, 2008).

In the academic point of view, universities should promote their academic staff quality, in order to catch today's conditions. In the year 2013, Technical University of Berlin makes reforms in 6 different issues in the university. Two of them are about promoting academic staff quality:

1. DIGIT is again an academic change for academicians. With this reform the use of new media in teaching and organization of the study will be expanded. E-Learning which is the innovative way of teaching, is going to be used by the lecturers. The lecturers support broadly.

2. The aim of the WIMI program is to improve staffing levels with training and counseling programs for scientific staff of TU Berlin. University has a teaching certificate program "Teaching and Learning". This program develops innovative teaching concepts so they can implement these concepts in their professional teaching immediately (Url-8).

Another example is the University of Leeds. At the University of Leeds the staff development unit provides professional academic training, including training academic staff how to teach, innovate and carry out research. The aim of the unit is building researcher skills at the university. The unit also helps faculties and schools to address culture change and other strategic issues, for instance facilitating away days on themes such as how to build a research culture that supports high performance in research (Knight and Holbeche, 2012).

Universities should be innovative, and catch technological developments in teaching research activities. In the University of Tartu Institute of Technology, the Innovation Voucher Grant program opened in 2010. This program supports innovative ideas, and many of the projects focus on energy efficiency and on being environmental-friendly according to catch current research issues (Hahn and Vassiliou, 2011). The University of Minnesota has an innovative project; Enterprise Financial System Project. As a result of aging and unsupported computer-based financial system, the entire University is moving to a new software system to handle all financial activities. This new system sponsored by the Office of Information Technology. This unit re-invented themselves for catching the technology (Berns et al., 2007, Url-10).

Moving to action, promoting relations with institutions, opening new units for technology transfer to follow the strategies determinate by management of universities are meant by the productivity title. Universities promote the linkages with industry and develop knowledge exchange with opening new units. Encouraging universities to become more engaged with regional business innovation is set within the context of higher education. Etzkowitz (2006) points out the importance of technology transfer offices and science parks to provide a field for academia and industry to facilitate the commercialization of scientific search. Again the case of Georgia Institute of Technology can be given as example. The university management opened 5 institutions as university-centered knowledge-hub initiatives (Youtie and Shapira, 2008). Since the mid-1990s, in the Potsdam University there is

a Science Park as a business incubator center. More than 1,300 scientists are working at the science park and the various university institutes have a total of 7.000 students. Many joint research projects have been funded under Framework Program 5, 6 and 7. European Regional Development Fund contribution to the development of the Science Park was EUR 74.3 million (Hahn and Vassiliou, 2011; Url-9). Another example is the Umea University, which started a progress for being an important part of regional growth. It was first in 1993 that the university adopted a policy of deepening its joint working with other educational and research institutions in the region and strengthening its cooperation with the community and industry. Umea University is an example defining as leader, organizer of projects include technology transfer, innovation systems, academics in companies, participation in a growth alliance with municipalities in the Umea region, north of Sweden (Hudson, 2006).

Another example is the EU-Drivers Project in the year 2010 with the aim of building collaborative partnership with industry, public institutions, firms, and local organizations. Across the European Union there is a growing body of policy and practice that seeks to mobilize universities as key actors in the development of cities and regions through their contribution to regional innovation. There are nine regional innovation partnership projects involved in the EU Drivers program. There are projects from regions in Belgium, Denmark, UK, Finland, Greece, Portugal, Spain and Turkey (Table 3.3).

Table 3.3 : The pilot innovation partnership projects in EU, adapted from ESMU (2012).

Project	**Country**
C - Mine	Belgium
Brains Business ICT North Denmark	Denmark
Turku Bioimaging	Finland
Solving the whey pollution problem in the region of Thessaly	Greece
MADAN Parque	Portugal
Malaga Knowledge Innovation Community	Spain
Campus of International Excellence Southern Catalonia	Spain
INOVIZ – Izmir for Health	Turkey
The Leadership Academy	United Kingdom

This innovation process aims that increase the relationship between universities, local government, stakeholders, and firms. There are projects, which are strengthened linkages between public institutions, universities and firms from different countries:

- In Belgium: The C-Mine Project partners Limburg Catholic University College, the City of Genk, artists, media and design companies.
- In Finland: TURKU Bioimaging, partners; University of Turku including the Turku School of Economics, Turku Science Park, The Centre for Economic Development, Transport and the Environment.
- In Turkey: INOVIZ-Izmir for Health, partners Ege University Science and Technology Centre, EBILTEM, Izmir Development Agency IZKA, Aegean Free Zone Development & Operating Company ESBAS.
- In Spain: MALAGA KIC, partners University of Malaga, Municipality of Malaga, Technological Park of Malaga (ESMU, 2012; Url-11; Url-12).

Other example is the Instituto de Tecnología Cerámica is a mixed Institute created by agreement between the Ceramic Industry Research Association and The Universitat Jaume I. It was established in 1969 in response to the needs and demands of companies from the Spanish ceramic cluster and has, over the years, articulated a

university–business cooperation system that has contributed significantly to the notable development of the Spanish ceramic tile manufacturing industry (Hahn and Vassiliou, 2011).

In the University of Minnesota, there is Extension Service that works into five capacity areas: agriculture, food and environment; community vitality; natural resources and environment; youth development; and family development. Extension celebrates 100 years of extending the University into every corner of the state, connecting the University to the people and taking University research from the labs into peoples lives. The new model provides to have strong relations with public, regional educators state specialists, agriculture, water resources, and forestry. And with the new model stronger ties with the University's academic and research resources are supplied. This model provides direct participation to regional development (Berns et al., 2007; Url-13).

"Twente Model" from University of Twente can be another example for relations and technology transfer to industry and SMEs in 1980s. The model had three key features:

1. The Transferpunt is a transfer organization to help SMEs gain access to University of Twente staff. Later the name was changed to Transfer Research and Development.
2. The Business Technology Centre located close to the UT, as a where university spin out companies could move in 1982.
3. The Temporary Entrepreneurial Positions Program stimulates and facilitates graduates and staff to establish their own businesses in 1984. The scheme offered grants to start-ups, provided that they were sponsored by a university department and would commit to producing business plans within one year, taking the advice from a "committee" of other regional entrepreneurs (Arnold et al., 2006).

Today universities realize the importance of graduates as labor force to meet demands for new qualities in human capital. In the La Trobe University producing high quality graduates becomes more important. Higher education is critical for the development of regional communities today. The University strategic plan indicates that La Trobe will develop sustainable, high quality and relevant teaching programs; develop a new approach that will enrich the student experience and enhance

employment and the skills required of active and engaged citizens; and develop educational programs in partnership with regional communities to meet their social, economic, cultural and environmental needs (La Trobe University, 2008).

Technical University of Berlin has reforms increasing quality of students and graduates in 2013, which are:

- MINT, is the name of project in native language. MINT is an academic change for the university. The university opened a two-semester certificate program for high school graduates who are interested in scientific and technical questions but not yet decided which department fits them. It is provide advantage to university in preference.
- TUTOR is an innovation that provides training opportunities for students. Knowledge acquisition, flow of information and networking are created to support the task exercise of students.
- With Study & Buddy, the university gives a great support for students for their learning life. Mentors have assigned to help students with their pre-employment questions.
- With project, project-based learning is promoted in the Bachelor degree programs. The aim is to integrate an immediate practice and research relating to the teaching and to support the self-organization abilities of students already in the initial study phase. It is intended to support up to five student projects annually. There is a budget for it (Url-8).

Table 3.4 : Summary of world cases in university transition.

Universities	Changed to …	How?
Georgia Institute of Technology (1885) Public University In the USA	- advance technology and economic development in its region, - increase internationalization of the university, - perform necessities of knowledge-based economy.	- By evaluating the role of the university as knowledge hub, - By starting international campus based programs including in France, Singapore and China, - By managing research activities and making strong relations with industry, - By opening 5 institutions as university-centered knowledge-hub initiatives.
Technical University of Berlin (1770) Public University In Germany	- help strengthen its competitive edge for adopting the changing environment, - answer the demand of standardization of curricula and degree programs, - develop staff, students and graduate quality with using technological developments.	- By developing a new organizational strategy for being an "innovative university", - By introducing an integrated Bachelor and Master degree program in the context of the "Bologna Accords", - By making 6 important reforms for students and staff to improve quality of them
Umea University (1965) Public University In Sweden	- be an important part of regional growth.	- By adopting a policy of deepening its joint working with other educational and research institutions in the region and strengthening its cooperation with the community and industry.
University of Glasgow (1451) Public University In Scotland	- build Glasgow's reputation in key markets and making the University truly International.	- By developing a strong international strategy, - By developing strategic partnerships, one of them is with Columbia University in New York.
University of Leeds (1904) Public University In England	- build researcher skills at the university, - help faculties and schools to address culture change and other strategic issues.	- By the staff development unit, - By providing professional academic training, including training academic staff how to teach, innovate and carry out research.
University of Minnesota (1851) Public University In the USA	- be a part of regional development, - serve better both its staff and students, - be an innovative university.	- By using technology to coordinate financial system, - By opening new units to provide better service, - By opening its doors to the public.

Table 3.4 (continued): Summary of world cases in university transition.

Universities	Changed to …	How?
EU-Drivers Project 2010	- build partnership with industry and public institutions, - build collaborative partnership.	- By 9 projects.
University of Tartu (1632) Public University In Estonia	- launch co-operation with research institutions for the purpose of implementing innovative ideas.	- By opening The Innovation Voucher Grant Program.
James I University (1991) In Spain	- response to the needs and demands of companies from the Spanish ceramic cluster.	- By opening an Institute with the Ceramic Industry Research Association.
University of Potsdam (1991) In Germany	- produce research projects, - enable institutes and firms a science park.	- By developing Golm Science Park.
La Trobe University (1964) Public University In Australia	- make a greater contribution to the social, economic, cultural and environmental outcomes for regional communities.	- By working jointly with local governments, employers, schools and Technical and Further Education Colleges, and with the State and Commonwealth Governments, - By producing high quality graduates.
University of Manchester (1824) In England	- have world-class research, - increase total research income.	- By determining core goals for the university.
KU Leuven University (1970) Independent/Free catholic university In Belgium	- respond to internationalization in education and research.	- By changing its policy with regard to new appointments and remunerations, - By entering into many bilateral international relationships.
University of Twente (1961) Public University In the Netherlands	- help SMEs gain access to the university staff, - act as incubator, - stimulate and facilitate graduates and staff to establish their own businesses.	- By opening a transfer organization the Transferpunt, - By the Business Technology Center, - By the Temporary Entrepreneurial Positions Program.

15 different cases and universities are reviewed to be example for changes in universities (Table 3.4). World Universities have defined their role as knowledge-hub. In order to have a well established economic growth and technological development in their region, these universities have set new visionary and strategic targets aiming at having the biggest part in terms of regional development. To that end, new institutes, divisions, technology transfer offices, technoparks are established to connect stronger with industries and to support them in R&D topics. In fact these initiatives were not only limited with industries, but also all regional communities were pulled into this knowledge sharing and interaction channel. Furthermore, to become more international in education and research, new academic reforms have started. For instance, under the scope of Bologna Accords, new Bachelor and Master Degree were formed and many bilateral international relationships were initiated. In addition, universities started to improve researchers' skills by opening staff development units providing academic training on how to teach, innovate and carry out research. Moreover, they have made further academic reforms to better address to the proffesionnal qualifications of students and alumnis.

With the rise of the knowledge-intensive economy, illustrated in the growing relevance of R&D, the contribution of university research to economic performance becomes more relevant, but teaching still remains the most important element, in particular in the disciplines of engineering and natural sciences.

By the evolution of knowledge-based economy, the place of knowledge has changed in the economic activities. The role of university changed by reconsidering their structural and resource commitments to various knowledge areas. External and internal dynamics that push university into a changing position were explained.

4. AN EVALUATION OF TRANSITION IN TURKISH UNIVERSITIES: ITU, BU, SU, BILGI CASES

4.1 Methodology of the case study

The case universities were chosen firstly according to categorization as being old, young, public and private. Secondly, Istanbul Technical University and Sabancı University are more specialized in the field of engineering, and Boğaziçi University and Bilgi University are strong in terms of social sciences. Thirdly, all of them signed important projects and innovations in Turkey. Therefore focus was given to the following universities:

- **ITU** (1773) has a 250-year history in Istanbul. ITU modernized its structures, campuses, and departments to style itself as a research university.
- **BU** (1863) was established as Robert College, and then turned into Boğaziçi University. The university has experiences for years and American culture from college times.
- **SU** (1999) is a private university, which founded by Sabancı Foundation that is one of the most important family companies in Turkey. The university became one of the successful universities in Turkey.
- **BILGI** (1996) is a private university. The university founded by the Bilgi Education and Culture Foundation. The university attracts notice because of their education systems and relations with society.

Related indicators are collected from universities' database and a small qualitative study designed to explore the changing nature of universities by means of knowledge-based economy in a small number of conducted primarily through 4 deep interviews. Vice-rectors of universities who are in charge of institutional management, R&D activities, research and application centers, and industrial relations were interviewed (see Appendix A). In terms of organizing of information the data provide evidence of three simultaneous processes: management, academic

and productivity. This might also form a basis for similar studies in the future.

The transition of universities is summarized in the previous chapters. Correspondingly, this chapter analyzes Turkish universities, by taking into consideration ongoing transition efforts of world universities and by exposing both existing and changing conditions of Turkish universities over the years. To be more precise, the analysis consists of evaluation of world cases and according to the outputs checking if there are any similarities in Turkish Univetsities.

4.2 Case of ITU, BU, SU, BILGI

4.2.1 General information about ITU, BU, SU, BILGI

Istanbul Technical University was established in 1773. ITU is one of the oldest universities in Turkey. In 1946, ITU became an autonomous university, including the Faculties of Civil Engineering, Architecture, Mechanical Engineering, and Electrical Engineering. ITU is a public university. The university has 5 different campuses; Ayazağa is the main campus, Gümüşsuyu, Maçka, Taşkışla and Tuzla. All campuses settled at the centers of Istanbul.

Boğaziçi University started teaching as Robert College. Dr. Cyrus Hamlin founded Robert College in Istanbul. In 1971, Boğaziçi University was officially established on what had been the Robert College campus for over one hundred years. Boğaziçi University is a public university located on the European side of the Bosporus strait in Istanbul. The University has 6 different campuses. Many of the University's buildings are located on its South Campus, with the Bosporus and the historical castle of Rumelihisar as its boundary to the east. This campus encompasses the oldest buildings of the University. The North Campus, Hisar Campus and Uçaksavar Campus host the relatively recently acquired facilities and are at walking distances from South Campus. The Kandilli Campus, housing the observatory, is on the Asian side of the Bosporus. Sarıtepe Campus, near Kilyos on the Black Sea coast is 34 km from South Campus.

In 1994 the Sabancı Group decided to establish a “world university” led by the Sabancı Foundation. In 1999 Sabancı University began education. The university has one main campus in Tuzla, Istanbul. Around university campus there are Sabiha Gökçen Airport, GOSB Technopark, 2 universities, Koç High school, and industrial

zones. There are shuttle services from main centers of Istanbul e.g. Taksim, Kadıköy, Bostancı, Bakırköy.

The Bilgi Education and Culture Foundation was founded in 1994. Istanbul Bilgi University took its place within the Turkish system of higher education as a civil corporation after the application made by the Bilgi Education and Culture Foundation in 1996. The university has three main campuses in Istanbul. These campuses are Kuştepe Campus, Dolapdere Campus, SantralIstanbul Campus that it continues to serve its students and the academic world in Turkey.

4.2.2 Management of ITU, BU, SU, BILGI

4.2.2.1 Management structures

Management structure of Istanbul Technical University and Boğaziçi University is the same as both of them are public universities. Rector, the university senate, and vice-rectors are managing these two universities. ITU University Senate, which is chaired by the rector, consists of the vice-rectors, deans, a faculty member from each faculty, who is elected by the faculty council for a term of three years, and the heads of affiliate departments, institutes and academies under rector (Figure 4.1). The Senate functions as the academic arm of the university. There are 7 advisors working with the rector in ITU, and 12 advisors working with the vice-rectors.

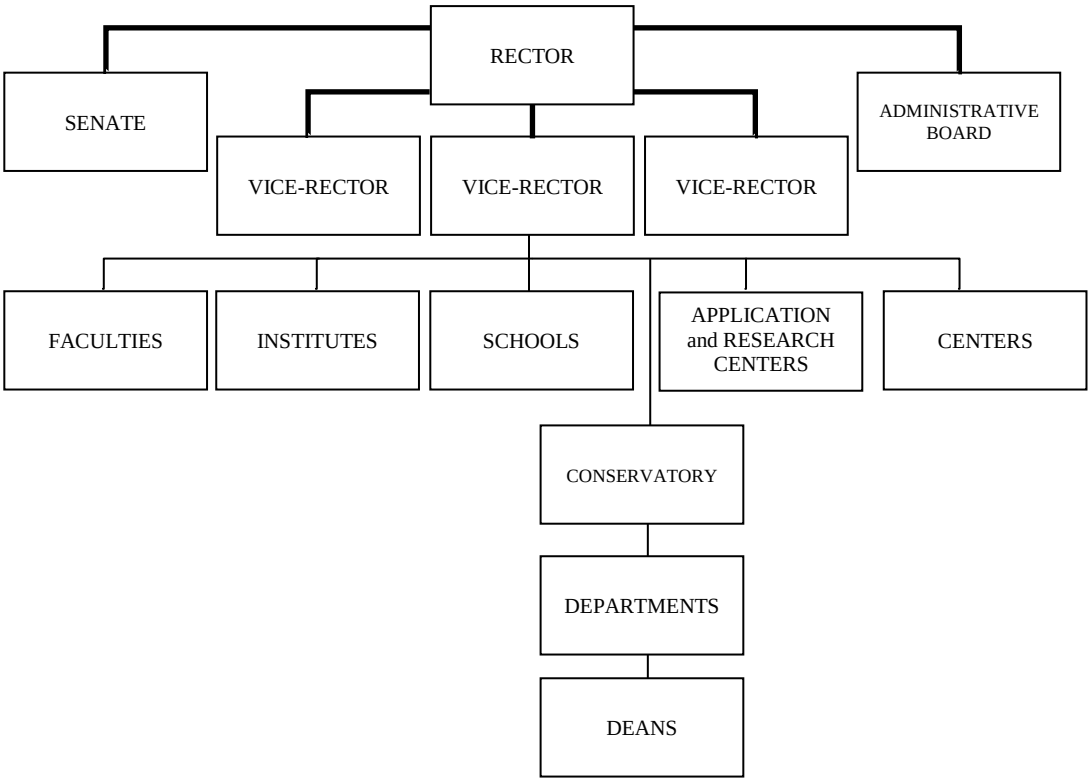

Figure 4.1: ITU administrative organization chart (Url-19).

Additionally, ITU prepares a new management chart. In this new chart, the university attaches importance to "communication office" (Figure 4.2). So with this new model and system, all data is going to collect and serve wholly.

For example, there is a newly assigned coordinator lecturer for the library. Aim of the coordinator is collecting and classifying citation index, H-index and other indicators according to faculties and serving the data as reports. This application is going to avoid confusion and increase accuracy rate. The faculty's profile is going to emerge clearly. It is important to read profiles of faculties and support them according to their publication ratio.

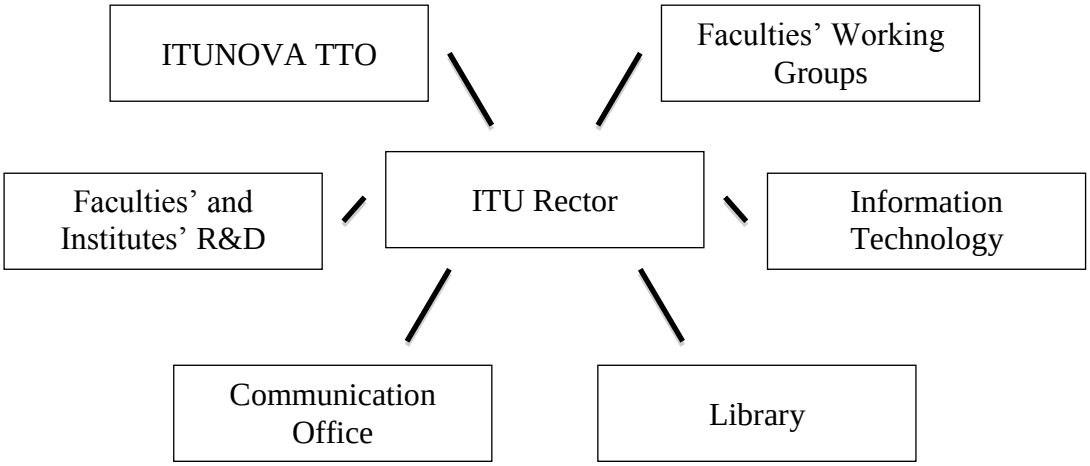

Figure 4.2: Units in the ITU new management chart.

As ITU, Boğaziçi University has same structure. University management structure composes rector, university senate, and university executive board. There are 2 vice-rectors and 6 advisors working with the rector in BU. University Senate has 21 members; university executive board consists of 14 members. However, Robert College history is very important for Boğaziçi University. When Robert College turned into Boğaziçi, all lecturers stayed same, it is very important. This makes a difference among other universities. Boğaziçi University is more flexible and less bureaucratic. Naturally institutionalism comes from bureaucracy, yet Boğaziçi manages the process more flexible. This attitude is the legacy of the college and Boğaziçi elaborates keeping tradition of college. Both ITU and BU has a budget from Ankara. By the year 2013 this budget is 310 million TL for ITU and 169 million TL for BU.

Sabancı University and Istanbul Bilgi University are private universities. Therefore their management structure is different from ITU and BU. In Sabancı University, there is a board of trustees includes 9 members. The chairman of the board is Güler Sabancı from Sabancı Holding and the rector of the University is also member of the board. There is also international board of overseers 11 members from all over the world. Dr. Kemal Derviş is one of them. There are 2 vice-rectors in the University. Other management units are general secretary, deans, directors, and student union. The principal revenues of Sabancı University are tuition fees, donations of the Sabancı Foundation, and donations of the Sabancı Group institutions. Tuition fees

make up for approximately 60% of annual expenses, and the remainder is obtained by donations and other sources of budget.

The distribution of these main sources in budget is like following:

- Tuition Fees: 58%
- Sabancı Foundation and Sabancı Group Donations: 23%
- Project & EDU Revenues: 10%
- Other Revenues: 9%

Bilgi Education and Culture Foundation Management Board contains 7 members. Board of Trustees consists of 12 members one of the rector of BILGI. There are 2 vice-rectors in Bilgi University; one of is responsible for financial and administrative matters, Audit Process of Turkish Council of Higher Education English Language Programs and the other one is responsible for academic matters, Research Office, Bologna Office, and International Center. There are 3 advisors in different subjects.

Table 4.1: Management structure (Url-20, Url-21, Url-29, Url-36, Url-37, Url-42).

	ITU	**BU**	**SU**	**BILGI**
Management Unit	University Senate	University Senate	Board of Trustees	Board of Trustees
Vice-Rectors	3	2	2	2
Advisors	7 for the rector, 12 for vice-rectors	6 for the rector	not exist	3 for the rector
Budget	310 million TL (2013)	169 million TL (2013)	Tuition Fees, Sabancı Foundation and Sabancı Group Donations, Project & EDU Revenues, Other Revenues	no data available

ITU and BU have the same management structure due to their university status as public. In SU and BILGI, the chairman and the board of trustees are the decision mechanisms. The Rector of Sabancı University does not have advisors compared with others. Regarding the budget, in public universities the yearly allocated amounts

are transparent and can be easily accessed. In return, private universities are less transparent and let limited access to this area. For instance, there is no information about the budget composition of Bilgi University (Table 4.1).

4.2.2.2 Visions and strategies of universities

All universities set their visions by emphasizing the importance of research and being international (Table 4.2).

Table 4.2: Visions of universities (Url-20, Url-29, Url-36, Url-42).

ITU	"Becoming a focus of leading studies in science, technology and art at national and international level as a contemporary research university."
BU	"Achieving international excellence in education and research and becoming a "green", sustainable university."
SU	"Being an innovative institution responsive to the needs of all our constituents through a participatory culture that embraces diversity and freedoms, having an interdisciplinary educational infrastructure that will create and disseminate knowledge, and aspiring to become an international reference point for innovation in education and research."
BILGI	"Being an international university that expands the boundaries of science and art, embraces freedom, takes a lead in the development of society, provides a place where students and faculty share a passion for learning, and where all members, both academic and administrative, dedicate themselves to this end."

There are important strategies, priorities and aims of universities to reach their visions. In ITU Performance Program (2013), important priorities were set about research, industry relations, creating labor. These priorities are:

- Dissemination of Information and Communications Technologies (ICT)
- Transition to high value added production in industry and services
- Enhancement of harmony of education with labor demand
- Enhancement of education
- Research-Development
- Improvement in relationship with industry

The aim of ITU is addressing regional and global problems in areas that ITU gives education, generating new ideas, producing perspectives, and revealing new values.

ITU takes the number 5 in the Entrepreneurial and Innovative University Index in 2013, behind Middle East Technical University, Sabancı University and Boğaziçi University (Table B.2). The aim of the university is taking the first place in this index.

Follow the same path; Boğaziçi University gives importance in research, industry relations and internationality. Following strategies were highlighted in the University 2010-2014 Strategic Plan:

- Producing qualified research
- Supporting research/practice/education activities about primary problems about society
- Improving communication and cooperation with national education and research institutions
- Providing settlement and development to be active in production of knowledge, skills and technology in newly established Technology Development Zone (Technopark).
- Developing a healthy and lasting cooperation with business and industry, identifying the basic principles of this cooperation and in the light of these principles establishing institutional infrastructure and units for processing this cooperation efficiently.
- Increasing university's international recognition and visibility
- Improving provided social services
- Being a "green campus"
- Placing institutional learning and increasing employee satisfaction.

The main strategy of Sabancı University is to become a leading and exemplary education and research base, which has continuous interaction with society, fed by questioning at the international level. The 2011-2015 Strategic Objectives of Sabancı University has 4 main topics: research, education and training, interaction with society, building a world university. Following strategies were highlighted by SU:

- Strengthen the process by which research outcomes are transformed into social an economic values,
- Undertake interdisciplinary and pioneering research,
- Allocate university resources to involve international research projects and attract more international researchers,

- Increase and encourage the researchers' mobility,
- Lead international research fields effectively, using our local and regional advantages,
- Develop international strategic partnerships.

The main aim of the Bilgi University is not just education also preparing students all conditions in their life. The aim requires instilling students not only technical knowledge on paper but also every application. Bilgi University is currently working on university's strategic plan.

Research, industry relations, internationality are highlighted by all 4 universities. ITU, BU, SU and BILGI emphasize the problems in society and sets strategies to involve and make solutions for these problems. Boğaziçi University use the term "green campus" and applies this terminology in every aspect with concrete examples (e.g. Hamlin Hall) to create a sustainable campus. Sabancı University and Bilgi University draw attention for freedom and relations with society. In the visions of ITU and BILGI it has been seen that the science and art have bigger importance particularly the art.

4.2.2.3 Strategic planning in universities

In the year 2006, public institutions in Turkey were obliged to prepare their institutional strategic plan as part of the European Union adjustment laws. The law no. 5018 Public Financial Management and Control was prepared under public financial reforms. According to the law, every public institution was obligated to prepare strategic plan. After the law every public university was obligated to establish the Department of Strategy Development. This Department in universities is on duty and use authority based on the law and regulations (Aktan, 2007). This step is very important for the university governance since the university set vision, mission and values, identify strategic goals and objectives, autonomy and responsibility, resource use and distribution, cooperation with stakeholders. Strategic plan is important for universities as comprising medium and long-term goals, basic principles and policies, objectives and priorities, performance criteria, resource distribution and methods to be followed and this is an important factor for universities to gain success.

To comply with the law, Istanbul Technical University and Boğaziçi University established the Department of Strategy Development within their institutional structure. Furthermore, in the process of the strategic plan, Strategy Development Board was established at Boğaziçi University and Strategic Planning Committee was established at Istanbul Technical University.

Boğaziçi University's first strategic plan involves the years between 2004-2008, and second strategic plan was for the years 2010-2014. The university's strategic plans began with a broad and comprehensive situation analysis of BU. SWOT analysis is very important for the strategic plan both BU and ITU have SWOT analysis. After SWOT analysis Boğaziçi University determined its vision, mission and principles, then strategic goals and objectives were came.

Considering Boğaziçi University's performance to get strategic goals, followings became prominent. For the quality of education and training there were two main strategies; one is conducting studies to peg the number of students limit value of 10.000, the other one is decreasing the ratio of undergraduate students per faculty member to the ratio 20 until the 2010. By the year 2014, Boğaziçi University has 13.107 students, and the ratio of undergraduate students per faculty member is 9,4; this means BU achieve this strategic goal.

Another important strategic goals are about research and development, to improve research facilities BU set two important strategies that are ensuring establishment of technopark and developing interdisciplinary studies and producing knowledge and technology at the universal level. BÜN Technopark Inc. has been founded in 2010; also Boğaziçi University has a technology transfer office today. Multidisciplinary projects are highly encouraged in Boğaziçi University.

Istanbul Technical University's first strategic plan involves the years between 2006-2008, second strategic plan was for the years 2008-2010 and the last one involves the years between 2012-2016. The university emphasized that with strategic plans ITU will have taken an important step to be an organization with self-managing, will implement decentralization concept by taking decisions in every department and every level in accordance with the strategic plan.

The strategic plan of ITU consists of two main groups as institutional analysis and institutional plan. The university's strategic plans began with vision, mission, values and main strategies of ITU. ITU also has a SWOT analysis in every strategic plan. After SWOT analysis Istanbul Technical University determined responsibilities, strategies, indicators and objectives.

It is not possible to make a comparison like Boğaziçi University about performance of ITU to get strategic goals without access to numerical data related to the strategic objectives. However, it can be seen on the whole thesis that ITU proceed many actions in order to achieve its strategic goals which are cooperation with the world, being entrepreneurial and innovative, supporting interdisciplinary approach and improving in research.

This transition was one of the most important changes in institutional structure for the two universities. Besides not having a strategic plan, the vision and mission of Sabancı University was formed, academic principles and four years of strategic objectives were identified. Bilgi University is currently working on university's institutional strategic plan.

4.2.3 Academic structure of ITU, BU, SU, BILGI

4.3.3.1 Information about students

As of 2013 ITU has over 30.825 students. 96% of the students are Turkish, and 4% of students are foreign students. BU has 14.218 students. 4,8% of the students are foreign students (485). SU has 3.712 students. 1,8% of the students are foreign students. BILGI has 13.773 students. 2,4% of the students are foreign students (Table 4.3).

Table 4.3: Number of students in universities (Url-51).

	Year	Undergraduate Students	Master Students	Doctoral Students	University Total	Foreign Students
ITU	1997	16.083	4.133	1.411	21.627	410
	2003	12.939	4.844	1.251	19.034	384
	2008	16.295	4.238	1.650	22.183	566
	2013	21.848	6.680	2.297	30.825	895
BU	1997	8.114	1.077	355	9.546	433
	2003	8.072	1.465	463	10.000	578
	2008	8.463	1.865	700	11.028	358
	2013	10.054	2.170	883	13.107	485
SU	2000	249	41	7	297	-
	2003	1.221	213	53	1.487	-
	2008	2.934	381	135	3.450	8
	2013	2.953	507	252	3.712	67
BILGI	1997	758	-	-	758	3
	2003	6.620	920	-	7.540	46
	2008	7.387	2.163	62	9.612	88
	2013	10.003	3.565	205	13.773	341

Istanbul Technical University has more students in both master and doctoral programs. Although Bilgi University was founded 25 years after the foundation of Boğaziçi University, BILGI has reached the number of undergraduate students in BU in a short time. Additionally, master and doctoral programs in BILGI were started after 12 years from foundation (Table 4.3).

Table 4.4: The ratio of international to domestic students (Url-51).

Year	**ITU**	**BU**	**SU**	**BILGI**
1997	0,019	0,047	0	0,003
2003	0,020	0,061	0	0,006
2008	0,026	0,033	0,002	0,009
2013	0,029	0,038	0,018	0,025

Table 4.5: The ratio of international to domestic students (2013) (Url-52, Url-53, Url-54, Url-55, Url-56).

University	Ratio of international to domestic students
Harvard University	0,24
Georgia Institute of Technology	0,89
University of Manchester	0,30
University of Twente	0,20
Technical University of Berlin	0,25

The ability of a university to attract undergraduates and postgraduates from all over the world is key to its success on the international stage. Universities, which have great success around the world, have high ratio of international students to domestic students (Table 4.5). Expressly, the ratio in the Georgia Institute of Technology is 0,89 that means nearly half of students are international students in the university. In the universities that have high international reputation like Harvard University this ratio is above 0,20. In Turkish universities the highest ratio is in Boğaziçi University as 0,038. Although this is the highest ratio, it is still less than 5 times from world universities (Table 4.4).

4.2.3.2 Academic staff

Academic personnel are one of the most important parts of universities in terms of fulfilling university duties. In ITU, there are total 2.233 academic personnel. 454 of them are professors, 221 associate professors, and 804 of them are research assistants. 0,17% of the academic personnel are foreign academicians (Table 4.6). In ITU there was an important change for academicians. The transition is the norm of finishing scientific research in 6 years for research assistants, which was applied in the end of 2012. This change was made to ensure the improvement of the quality of research in the university.

In BU, there are total 1.063 academic personnel. 193 of them are professors, 186 assistant professors, and 334 of them are research assistants. 5,8% of the academic personnel are foreign academicians (Table 4.7). As an innovative move, in 1995 university started to use “instructor forum” with an e-mail system for the first time. Every instructor, even rector and vice-rectors were in this system, everyone could reach anyone in the university and share all kind of ideas. It is very important step for transformation of the university, open-minded and technological friendly. Boğaziçi University does not accept academicians who have completed all their

education in BU. University needs academicians who for example has doctorate degree from other universities especially foreign universities. With this rule university becomes more presentable and well known around the world.

In SU, there are total 368 faculty members. 43 of them are professors, 49 associate professors, and 3 of them are research assistants. 6,7% of the academic personnel are foreign academicians (Table 4.7). In Sabancı University, 181 academicians have average 4 years work experience in public or private sector. This means academicians use their work experiences in teaching and other topics in the university. Having work experience is a reason for preference for the university.

In BILGI, there are total 674 faculty members. 65 of them are professors, 28 associate professors, and 98 of them are research assistants. 9,4% of the academic personnel are foreign academicians (Table 4.7).

Table 4.6: Number of academicians in universities in 2013 (Url-51).

	Professors	Associate Professor	Research Assistant	University Total	Foreign Personnel
ITU	454	221	804	2.233	4
BU	193	186	334	1.063	62
SU	43	49	3	368	25
BILGI	65	28	98	647	61

Table 4.7: The ratio of international to domestic staff (Url-51).

Year	**ITU**	**BU**	**SU**	**BILGI**
1997	0,003	0,021	0	0
2003	0,003	0,032	0,172	0,104
2008	0,002	0,048	0,143	0,154
2013	0,001	0,061	0,135	0,099

Table 4.8: Number of students per faculty member (Undergraduate + Graduate) 2013 (Url-52, Url-53, Url-54, Url-55, Url-56).

University	Total Student	Academic Staff	Number of students per faculty member
ITU	28.528	2.233	12,77
BU	12.224	1.063	11,49
SU	3.460	368	9,40
BILGI	13.568	647	20,97
Harvard University	21.349	2.500	8,53
Georgia Institute of Technology	20.941	1.095	19,12
University of Manchester	38.430	4.030	9,53
University of Twente	9.350	1.000	9,35
KU Leuven University	41.255	5.939	6,94
Technical University of Berlin	28.344	3.034	9,34

Number of stıdents per faculty member is an important criterion about quality of education and accessibility of academic staff. Istanbul Technical University and Boğaziçi University have average 11 students per faculty member and Bilgi University has 20 students. With this ratio Bilgi University has similarities with Georgia Institute of Technology. Other world universities have less than 10 students per faculty member (Table 4.8).

4.2.3.3 Departments and institutions

Departments and institutions in universities are cradle of research and education. Istanbul Technical University currently has 13 faculties, 39 undergraduate programs, 5 two-year degree programs, and 6 institutes. After 2004 until today two faculties opened. The latest opening faculty is the Faculty of Computer and Informatics in 2010, which is the first one in Turkey. Computer Engineering Department has transferred in this new faculty.

Boğaziçi University has 4 faculties, 32 undergraduate programs, 54 master 31 doctorate programs, 2 two-year degree programs, and 6 institutes. In Sabancı University, there are 3 faculties, 12 undergraduate programs, 30 graduate programs, and 7 minor programs. There is a new program starting admitting the first students

during the 2014-2015 academic year. The new program is the Psychology undergraduate program at the Faculty of Arts and Social Sciences.

Bilgi University currently has 6 faculties, 2 institutes, 3 schools, 2 vocational schools, and more than 100 programs that provide education to its associate, undergraduate and graduate students. After 4 years from establishment of the university in 2000, there are 4 faculties in the university. In 2009 Faculty of Architecture and in 2010 Faculty of Engineering were opened. Engineering Faculty does not graduate yet. And last year in 2013, the School of Tourism and Hotel Management was opened with a department of Gastronomy and Culinary Arts. For the future, the university plans that opening Faculty of Dentistry and School of Medicine. A new understanding about law education comes out with Legal Clinic in Bilgi University. Legal Clinic is a two-term course for senior law students and also the first and foremost clinical legal education program in Turkey, which aims to practice the basic legal skills through real legal cases, was also constructed under the above-mentioned parameters in the curriculum.

Table 4.9: Opening years of faculties in universities (Url-20, Url-29, Url-36, Url-42).

	ITU	BU	SU	BILGI
1946	-Civil Engineering, -Architecture, -Mechanical Engineering, -Electrical Engineering			
1953	-Mines			
1963	-Chemical and Metallurgical Engineering			
1970	-Naval Architecture and Ocean Engineering			
1971		-Engineering, -Arts and Science, -Economics and Administrative Sciences		
1982	-Science and Letters	-Education		
1983	-Management, -Aeronautics and Astronautics			
1992	-Merchant Maritime			
1996				-Arts and Sciences, -Economics and Administrative Sciences
1997				-Communication, -Law
1999			-Engineering and Natural Sciences, -Arts and Social Sciences, -Management	
2004	-Textile Technologies and Design			
2009				-Architecture
2010	-Computer and Informatics			-Engineering

Istanbul Technical University has opened different faculties when proper infrastructure were set since 1946 (Table 4.9). The Faculty of Computer Informatics that lastly opened, gathered together Computer Engineering, which was under the Faculty of Electrical Engineering, and Information Technologies. Correspondingly,

Bilgi University has opened different faculties in different times since the foundation. Boğaziçi University and Sabancı University continue to provide training by opening faculties in a single step.

4.2.3.4 Education facilities

4 case universities set their visions by emphasizing the importance of being international for a university. In 1996 all of the programs in ITU commenced 30% English education. As from the year 2009 the university started 100% English programs step by step. Today all programs have 100% English that are not obligatory but selective. In ITU School of Foreign Languages, 5 different languages are provided. Boğaziçi University offers education in 100% English. The university currently provides education in 6 different languages in the School of Foreign Languages.

Also in Sabancı University all programs are 100% English. And the School of Languages currently provides education in 12 different languages. In Bilgi University all programs are 100% English, except in the Faculty of Law. And the School of Languages currently provides education in 4 different languages.

Table 4.10: Languages in universities (Url-22, Url-34, Url-39, Url-47).

	Language of Education	Languages in the School of Language
ITU	100% English (2009, selective) 30% English	German, Japanese, Italian, French, Spanish
BU	100% English (obligatory)	Armenian, German, Romanian, French, Spanish, Russian
SU	100% English (obligatory)	French, German, Italian, Latin, Japanese, Russian, Spanish, Persian, Arabic, Ottoman, Chinese, Kurdish
BILGI	100% English (obligatory, except in Faculty of Law)	German, Italian, Spanish, Kurdish, Turkish Sign Language

Except ITU, all universities have 100% English education since establishment. Sabancı University offers a wide range of foreign language courses in the School of Language. Bilgi University is different with the course of sign language (Table 4.10).

4.2.3.5 Internationality

All the universities offer various change programs for their students and academic staff. The universities have agreements with universities all around the world under the Erasmus, Bilateral, and Laureate Programs (Table 4.11).

Table 4.11: Internationality of universities (Url-22, Url-34, Url-39, Url-47).

	Ratio of foreign students	Ratio of foreign academicians	University partners in exchange programs (total number)	Exchange programs
ITU	4%	0,17%	277 (from 2003)	Erasmus
BU	4,8%	5,8%	254 (from 1999)	Erasmus
SU	1,8%	6,7%	196 (no data available)	Erasmus, Bilateral
BILGI	2,4%	9,4%	228 (no data available)	Erasmus, Bilateral, Laureate, Articulation Agreements

Istanbul Technical University has agreement with 277 different universities in Europe and UK with Erasmus Exchange Program. The program started in 2003 with 14 students and 1 university. Every year more than 300 students in undergraduate and 100 students in graduate programs apply and select for Erasmus exchange program. There is a change in application requirements. Students, who want to go study in a foreign university, should know the country language at A2 level. In this way the quality of education is going to be higher.

Achieving an international level academically is very important for ITU. New model has an “international academic cooperation unit”, which works through obtaining finance to welcome guest lecturers around the world in order to strengthened in the international arena. Today ITU has around 900 foreign students. Target is increasing this number to 5.000 foreign students.

Boğaziçi University maintains a select portfolio of partner institutions for student exchange. A main principle of exchange programs is: as Boğaziçi students you should be enrolled at Boğaziçi and pay your regular tuition fee to Boğaziçi. The institution you are nominated for (host university) waives all tuition and registration

fees but you are responsible for your travel, lodging and living expenses. Some of these exchange agreements are covered under the Erasmus Program and partially funded by the European Union.

The European University Association evaluated Boğaziçi University's academic and administrative procedures in 1999. The Accreditation Board for Engineering and Technology evaluated the Faculty of Engineering in 1997, 2004 and 2010, and as a result, all Engineering undergraduate programs at Boğaziçi University have full ABET accreditation.

Boğaziçi University maintains an active portfolio of high caliber academic partners from 34 countries. The university receives approximately 600 incoming exchange students and sends about 500 students for exchange programs every year. Boğaziçi University has 254 international university partners from 34 different countries all around the world.

Boğaziçi University belongs to a series of international university networks that share the same goal of enhancing academic cooperation among its members.

- IAU - International Association of Universities
- Magna Charta Universitatum
- EUA - European University Association
- UNIMED - Mediterranean Universities Union
- Black Sea Universities Network
- SEFI - European Society for Engineering Education
- The Utrecht Network

There is a short-term visit opportunity to Indiana University for faculty members. Full time Boğaziçi faculty members can apply for a short-term (one month) research visit to our academic partner Indiana University.

In Sabancı University, there are two types of exchange agreements: Erasmus and Bilateral. The only difference between Erasmus and Bilateral agreement is Erasmus students may receive mobility grants provided by the EU to partially meet living expenses of exchange period. In bilateral exchange program, students must cover all their expenses except tuition fee. There are 159 universities in 36 countries as part of the ERASMUS program and 37 universities in 19 countries within Bilateral Agreements. Sabancı Harvard Summer School is a remarkable example of

internationality of the University. The name of the program is History and Human Rights. This eight-week program offers coursework in history and human rights in Istanbul, Turkey.

Istanbul Bilgi University began a long-term partnership with Laureate Education, one of the largest international education networks in the world, in 2006 and continues to be a part of this network.

Memberships of the university:

- Laureate International Universities' Network as being the first and only in Turkey
- European University Association
- The Magna Charta Observatory of Fundamental University Values and Rights
- United Nations Global Compact (UNGC)
- Principles for Responsible Business Education (PRME)
- International Association of Universities

Exchange opportunities in Bilgi University are provided with partner institutions as below:

- Bilateral Exchange: Agreements with 13 different university from USA, Canada, Japan, South Korea, Hong Kong, and Georgia.
- Articulation Agreements: Students who like to complete 2-year studies or complete their bachelor degree abroad can apply Salford University, University of Roehampton, Kendall College, University of Incarnate Word, and Western New England University.
- Erasmus Exchange: The University began to participate in the Erasmus Program during the 2004-05 academic year.
- Laureate Exchange: Agreements with 13 different universities are in Laureate.

Bilgi University provides its academicians and staff exchanging with two programs. One of is the training staff exchange and the other one is teaching staff exchange.

Table 4.12: Membership of universities in international networks (Url-22, Url-34, Url-39, Url-47).

International University Network	**Members**
European University Association	ITU / BU / SU / BILGI
The Magna Charta Universitatum	ITU / BU / SU / BILGI
International Association of Universities	ITU / BU / BILGI
European Society of Engineering Education	ITU / BU
Black Sea Universities Network	ITU / BU
United Nations Global Compact	SU / BILGI
Principles for Responsible Business Education	SU / BILGI
Utrecht Network	BU
Mediterranean Universities Union	BU
Laureate Education	BILGI

In the case of student exchange agreements, it is seen that private universities are more enterprising than public universities. Especially in Bilgi University, they have various exchange agreements (Table 4.10). Boğaziçi University has the most membership of international networks. Bilgi University comes after BU although being a young university (Table 4.12).

4.2.4 Productivity of ITU, BU, SU, BILGI

R&D activities, knowledge creation, industry relations, products, graduates of universities were examined under the topic of productivity of universities.

4.3.4.1 R&D activities

Istanbul Technical University serves 11 different research support programs and 10 research centers. ITU European Union Centre was established in 2002. In European Union Center there are an Erasmus Office and a Research Office. 7 million of the

ITU budget is allocated for Scientific Research Project Unit. Revolving funds, funds from TUBITAK, Ministry of Science, Industry and Technology, Ministry of Development, income from other industrial projects also using for research. Total research expenditure is total 111 million TL in Scientific Research Project Unit.

Istanbul Technical University produced 46 projects in 7th Framework Programs (2012-2020). In the previous framework program, which includes 2004-2011, 47 projects were suggested and 22 of them found successful by the European Commission.

There is 50% success in the projects for framework programs which means more fund, more opportunity, more research experience and it is very important for ITU in today's world. ITU has 6 innovation products, which are the first in Turkey. In the year 2013, the ITU Commission of Scientific Research Projects supported 720 projects. The fund was assigned is 6.305.000TL. From the year 2002 total the Commission had run total 1244 project.

The first local helicopter "Arıkopter", the first cube satellite "ITUpSAT1", the first communication satellite "Türksat3USAT", the first unmanned automobile "Oto-Mobil", the first boat working with hydrogen "Martı" and the first minibus with electric in Turkey was made by ITU. ITU contains 360 R&D laboratories. Supporting student research is very important for ITU. There are 6 student projects, which supported by ITU.

ITU gives supports to master and doctorate student very easily. For master studies 5.000 TL, for doctorate students 15.000 TL financial supports is available. Amount of support increases 50.000 TL for the peer-reviewed projects.

ITU is setting up a new information technology system to catch up technological opportunities. Studies are continuing to integrate research and development to this system accurately.

In Turkey, Ministry of Science, Industry and Technology supports firms to motivate them promote R&D activities. In this context, ITU is arranging meetings with firms in order to find how ITU contributes their R&D activities. Currently, ITU Technology Transfer Office made programs to negotiate 400 different firms. The aim of these meetings is to start at least 2 projects with these firms according to develop R&D. ITU sets important R&D and innovation targets to make stronger its position

in the arena of international science and technology with increased support to ITU R&D studies:

- ITU gives its academicians an opportunity working in industry institutions in Turkey or foreign countries up to 12 months by paid leave.
- Industry-Supported Researchers Model provides successful students to take topics of R&D and product development of industrial institutions as a thesis study. ITU provides also financial support and spending all time about solutions of the industries' technological problems in related institution of ITU. Energy Institute implemented the first example of this model successfully. The target is to perform this model in every institute of ITU.
- TTO also a strategy an target that is accomplished.
- In the year of 2008, ITU ARI Technopark R&D area is 25.000m^2. The target for the year 2016 is 250.000m^2 R&D area.

TU started to pay more attention to multidisciplinary projects. It is very important that different departments, institutes working together in projects. For example, to implement for 3D printer project, computer engineering, materials engineering and electrical engineering cooperation. For this cooperate work, ITU gives special support to all include departments. For each participating lecturer, ITU reserves fund amount of 50.000 TL and provides opportunity to actual participate in TUBITAK thematic calls.

Boğaziçi University contains 115 research laboratories and 20 research and application centers. The university attracts research funding from both national and international research funding organizations as well as from industry. R&D budget consists of revolving funds, cut from main budget from Ankara, projects by faculty entrepreneurship, funds from TUBITAK, EU. Boğaziçi has total 48 million TL R&D budget for 2013. Partnerships with leading academic institutions across the world have strengthened the university's prominence in research. The university is currently involved in 50 ongoing European projects. Boğaziçi University researchers also take part in various U.S.-based projects.

According to the 2013 Turkish Ministry of Science, Industry and Technology rankings, Boğaziçi University was ranked first in Scientific and Technological Research Aptitude, based on number of publications, number of citations, externally funded projects, awards, and Ph.D. degrees granted (Table B.1). BU is the only Turkish university in the Times Higher Education 2013/2014 world rank (Table 4.13).

Table 4.13: Scores of BU in the Times Higher Education 2013/2014 world rank (Url-57).

Teaching	20.5
International Outlook	49.8
Industry Income	45.9
Research	22.8
Citations	88.2
Overall Score	44.3
World Rank	199th

Center for European Studies (CES) was founded in 1991 as an academic institution of Boğaziçi University. CES enables the academics to make interdisciplinary work on European studies and also serve as a focus point for the discussions on EU-Turkey relations where the academics share their opinions with public and private sector professionals. Furthermore, CES organizes public Jean Monnet seminars and specialized workshops, as the first "Jean Monnet Center of Excellence" in Turkey.

There was a fresh administrative change in Boğaziçi University for R&D activities. Technopark, TTO, R&D, offices of scientific research projects, budget of research, KOSGEB, TEKMER, all research activities in charge of vice-rector who is responsible for R&D, on behalf of gathering management in one place. It gives advantages for strong communication with all units.

There are activities to support R&D and entrepreneurship in Boğaziçi University:

- HayalEt Platform is an initiative supported by the Istanbul Development Agency and operated by Boğaziçi University TTO within the scope of technology transfer, innovation, entrepreneurship, business development, bringing together investors and commercialization of new ideas.
- Inovita Collaboration Platform is an initiative funded by the Istanbul Development Agency with a purpose of transferring knowledge resulting from the scientific research in the life sciences into economic value and the

development of new technologies for the region's welfare.

- İşteBU Project Competition aims at promoting university students to produce and implement new ideas, and encourages innovation and technology based entrepreneurship. The Faculty of Engineering with Elginkan Foundation's support had organized the competition every year since 2008.

Multidisciplinary projects are encouraged in Boğaziçi University. University has two different incubator centers and provides opportunity to students setting up companies with their ideas.

In the first period of 2013 Istanbul Technical University had support from TUBITAK with 26 projects. This makes ITU number one among other 88 universities all around Turkey. Boğaziçi University was supported by TUBITAK with 21 projects (Table 4.14).

Table 4.14: Number of projects supported by TUBITAK in term of 2013/1 (Url-21).

Universities	Number of supported projects
1. *Istanbul Technical University*	26 projects
2. Middle East Technical University – Ege University	23 projects
3. *Boğaziçi University*	21 projects
4. Hacettepe University	20 projects
5. Ankara University	18 projects

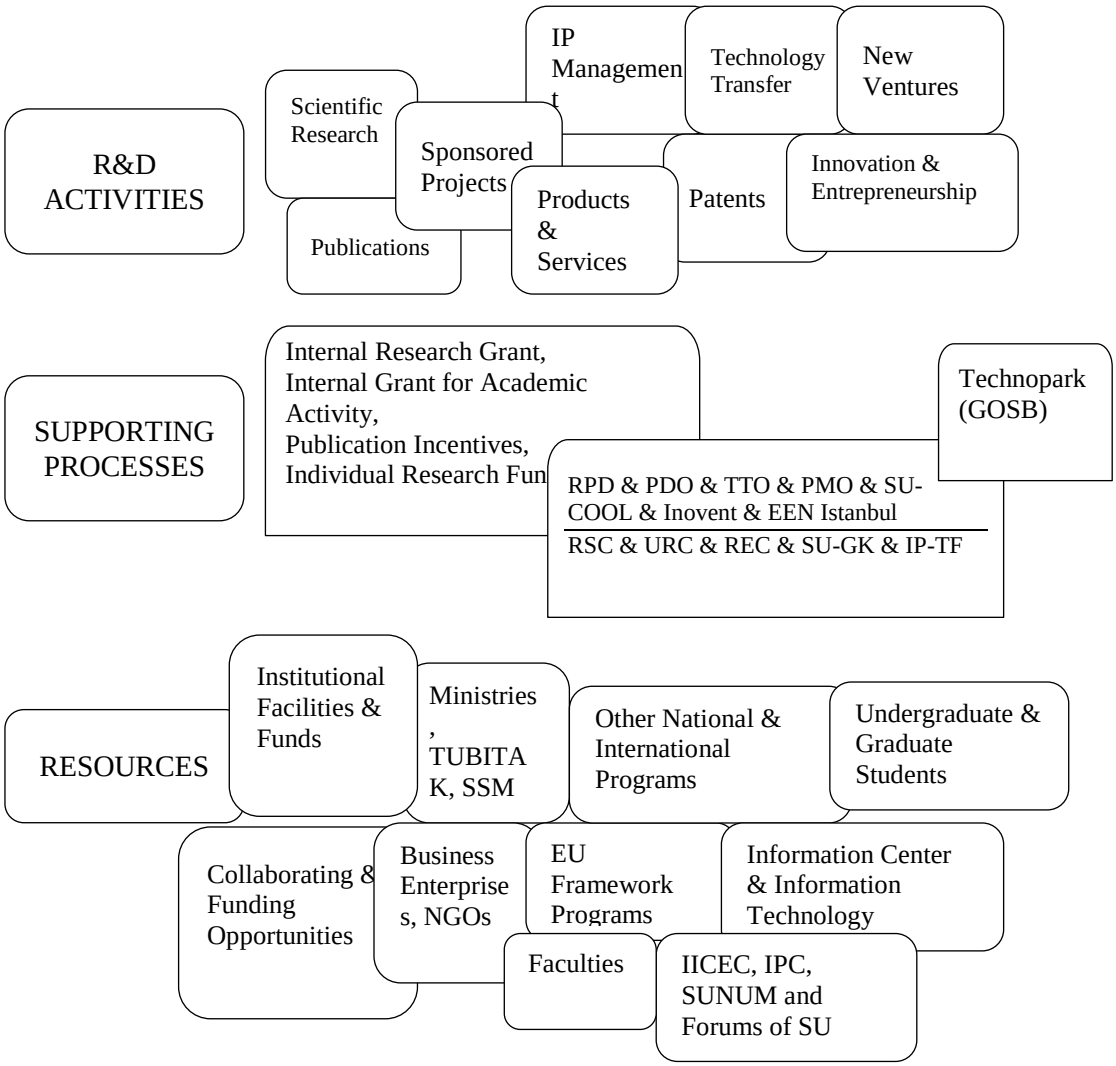

Figure 4.3: Research organization of Sabancı University (Url-38).

In Sabancı University, a systematic organization for R&D was formed (Figure 4.3). Current research grants and contracts have reached approximately 95 million TL. The main sources of grants are TUBITAK and European Commission Framework Programs. Sabancı University is ranked fourth with 19 projects, totaling 3,4million Euro at the 6th Framework Program. It is ranked first according to the amount of grant per researcher among Turkish universities. Sabancı University is highly successful at the 7th Framework Program and is a leader with 34 projects amounting to a budget of 6million Euro among Turkish universities.

The Research and Graduate Policies Directorate is most important center for R&D in Sabancı University. There are 28 doctorate degree fulltime personnel in RGP. SU has 130 person academic staff and 28 of them support this service, this ratio is very

important for the university. In Sabancı University, they are working like finance manager as doing portfolio management.

Sabancı University has a triple structure in R&D and entrepreneurship. First of them is the pre-incubation center. In this center there are 10 entrepreneurs. Second one is the incubator center, includes 16 firms from SU in GOSB Technopark. The last one is the post-incubator center.

Sabancı University's TUBITAK support has increased 22 times in 8 years (Table 4.15).

Table 4.15: Top 10 list of universities getting support from TUBITAK in the year 2011 (Comparing 2003 with 2011) (Url-58).

	University	2003 (Thousand TL)	2011 (Thousand TL)	2011/2003
1	METU	1.658	11.122	X 7
2	Ege Univ.	401	8.871	X 22
3	Ankara Univ.	622	8.504	X 14
4	Bilkent Univ.	619	8.501	X 14
5	**ITU**	**848**	**8.409**	**X 10**
6	Hacettepe Univ.	841	6.578	X 8
7	Istanbul Univ.	69	6.201	X 90
8	Akdeniz Univ.	26	6.011	X 227
9	Koç Univ.	170	5.353	X 32
10	**Sabancı Univ.**	**242**	**5.256**	**X 22**

Sabancı University has Istanbul Policy Center. Istanbul Policy Center is an independent policy research institute with global outreach. Center's mission is to foster academic research in social sciences and its application to policy making. Center committed to providing decision-makers, opinion leaders, academics, and general public with innovative and objective analyses in key domestic and foreign policy issues. For the relations with society, there is a required course for undergraduate students. Civic Involvement Project is designed to give students an understanding that every individual not only can, but also has a responsibility to contribute positively to society. Sabancı University sees learning to take an active role in understanding life's realities by addressing them is an essential aspect of high-quality higher education.

In Istanbul Bilgi University, The Office of the Provost for Research fosters and promotes the pure and applied research and scholarly activity at BILGI by ensuring that faculty, staff and students receive the assistance and support necessary to engage

in a wide range of research and development activities. BOPR offers essential and strategic expertise to support all aspects of sponsored activities including research compliance, proposal development and pre-award and promotion services, interdisciplinary and new program development, and guidance on conceptualizing and protection of intellectual property.

The role of BOPR is to facilitate the ability of the university's faculty to excel at research and to ensure that the broader community understands the important role that research, creativity, innovation and scholarship play in generating the intellectual energy that makes the university such a special place.

There are 18 research centers in the university such as Center for Atatürk Studies, Information Technologies Law Research Center, Energy and Sustainability Studies. 3 projects in the university are supported by TUBITAK.

Istanbul Bilgi University has a long-standing and firm commitment to establish, develop and support academic study programs and research on the European Union. Bilgi has been very active in raising public awareness on EU and related issues and has organized a number of conferences and workshops on sensitive issues, linked to EU integration, migration, poverty, exclusion, human rights, democratization, and social outreach projects. First, the university has led to the launch of the Center for European Studies in April 2005. The Center was established with the aim of undertaking in-depth research on EU politics and policy with specific emphasis on foreign policy, politics in the expanded EU neighborhood and relations between Turkey and the EU within the scope of EU enlargement. Secondly, Bilgi was attained in 2006 with the decision of creating the second "European Institute" in Turkey. The European Institute is now the primary focus for the interdisciplinary study of processes of integration in the politics, legal systems, society and economies of Europe. To this end, the European Institute offers interdisciplinary academic programs on EU studies and undertakes and supports research on these themes. It also serves as a public platform hosting lectures, panel discussions and open discussions on Europe and the EU. The European Institute is also outward looking and is developing collaborative links with international partners and seeks to promote Bilgi as a Center of Excellence for teaching and research on Europe.

The Faculty of Engineering was opened in 2010 and first conference of the faculty is going to be "International Energy and Management Conference" in June 2014. The

aim of this conference is to gather researchers working in the field of energy and the public or private companies performing on the energy sector to share their knowledge on the recent trends, scientific developments, innovations and the energy management methods. ICEM2014, invites academicians, scientists, institutions and companies conducting research or business in the energy field/sector to attend and/or to contribute to the conference by submitting an abstract. The Faculty of Engineering will be more active.

In Bilgi University, Center for Civil Society Studies was established in 2008. The main purpose of the Center for Civil Society Studies is to support the development of civil society both in Turkey and in the world. The Center aims to contribute to this progress by means of conducting scientific research, application and training programs, publications and documentation on the social, economic and cultural dimensions of this development. Working in cooperation with official and private institutions, and non-governmental organization, it strives to contribute to the accumulation of knowledge on related fields.

- NGO Training and Research Center was established in March 2003, in order to respond to the needs and problems of NGOs, to contribute to the solutions of these problems and to institutionalize the support for the civil society. The Centre is the first of its kind in Turkey, as being founded in a university, and it aims to contribute to efficient functioning of NGOs and to strengthen the role of NGOs in participative democracy.
- Youth Studies Center: The unit was founded in August 2006 by a joint protocol between the University and the Community Volunteers Foundation is working under the Civil Society Studies Center of Istanbul Bilgi University .The Unit has been running projects on 4 main program areas mainly Advocacy, Research, Networking and Modeling in order to contribute to the recognition of youth work and to develop youth policy proposals for a more a democratic youth policy in Turkey. As a principle, the Unit prefers to work in corporation with both active youth organizations and public stakeholders in the field.
- Children Studies Center: Istanbul Bilgi University Child Studies Unit, founded in 2007, works in the training, research and advocacy fields aiming at the realization of children's rights.

- Social Responsibility Projects

University has strong relations with NGOs, and social responsibility programs and projects. In Bilgi University there is a summer school for high school students to introduce them jobs and departments of the university. This summer school is free but it has limited quota. The aim of the school is helping students when they choose their future, giving them the opportunity to find out what they want to be.

Table 4.16: R&D activities of universities (Url-20, Url-29, Url-36, Url42).

	Number of Research Center	R&D Expenditure in 2013	Number of Projects in the European Commission 7th Framework Program	Products of university
ITU	10	111 million TL	46	Arıkopter, ITUpSAT1, Türksat3USAT, Oto-Mobil, Martı, electric minibus
BU	20	169 million TL	no data available	RoboAKUT
SU	11	95 million TL	34	SURALP
BILGI	18	no data available	no data available	RoboSantral

Boğaziçi University has 20 research center and has the highest amount of R&D expenditure in 2013. Istanbul Technical University has 6 products all of them were first in Turkey (Table 4.16).

Table 4.17: R&D activities of universities (2013) (Url-59).

University	**Article**	**Citation**	**Total Document**	**Collaboration**	**Total**
University of Minnesota	98.57	96.13	47.09	60.59	445.77
University of Manchester	95.66	90.03	45.33	70.92	437.22
KU Leuven University	87.36	81.07	40.43	67.36	396.22
University of Glasgow	79.55	79.60	38.37	62.85	384.19
Georgia Institute of Technology	82.92	78.56	39.31	54.91	374.55
University of Leeds	79.49	77.04	38.31	59.28	371.16
Umea University	72.11	70.56	33.47	52.74	339.50
University of Twente	70.81	67.57	32.97	49.92	326.72
Technical University of Berlin	70.14	67.08	33.02	50.51	325.43
University of Tartu	66.77	65.67	31.43	48.65	316.07
Istanbul Technical University	67.25	64.84	31.47	46.83	311.62
Boğaziçi University	64.46	63.83	30.30	46.35	305.50
James I University	63.74	63.61	30.09	45.57	302.81
Sabancı University	30.02	43.10	16.56	38.70	191.30

According to rankings of University Ranking by Academic Performance by Middle East Technical University, Istanbul Technical University and Boğaziçi University were coming behind other world universities with total score of 311 and 305. Sabancı University had the lowest score and Bilgi University was not in the list (Table 4.17).

4.2.4.2 Industry relations

Especially in the knowledge-based economy, industry relations are very important for participating economic activities more directly. These relations can be achieved in various ways. Technoparks, technology transfer offices, incubator centers are

important facilities to have a relationship with economic actors. These facilities were examined on the basis of case universities.

Istanbul Technical University and Boğaziçi University has their own technoparks in the university land. Sabancı University prefers to be a Group B founding shareholder of GOSB Technopark. Today, Bilgi University does not have a technopark.

ITUARI Technopark was established in 2002. In July 2012 there were 91 firms and total 2723 employees, 2068 of them are R&D personnel. From 2012 until 2014, 11 new firms joined to ITUARI Technopark. Today 102 firms continue operation. There 3 industrial cooperation in ITU, which are ITU ARI Technopark, ITU Digital Base of Turkey, Automotive Technology Research & Development Corporation.

First Technology Transfer Offices opened with the support of TUBITAK in 10 universities in Turkey. ITU is the one of them. ITUNOVA Technology Transfer Office put into service in January 2014. ITUNOVA TTO lends assistance to ensure the cooperation between university and industry and to turn academic knowledge to commercial value.

ITU aims to use the global science and technologic progress to contribute society directly. In light of this objective, ITUNOVA TTO has established to bring together knowledge with industry, to supply commercialization of knowledge, and to service as a technology interface of ITU.

Services in ITUNOVA TTO;

- National and International Funds Unit
- University-Industry Cooperation Unit
- Intellectual And Industrial Property Rights Unit
- Entrepreneurship And Incorporation Unit

With ITUNOVA TTO the cooperation between the university and private sector will be developed. At the same time number of university-industry partner R&D projects will be increased. There is 1 million TL support early stage technology fund to support research projects, which have commercial potential.

There are over 40 academic firms in Technopark spent 7 million TL. In 2013, projects cost 130 million TL.

Currently there are over 50 firms are waiting for settling down in ITUARI Technopark. Technopark in ITU is a preferred area for firms because of its location and facilities provided by ITU. At this stage ITU Management decided to make a performance index with the current firms in Technopark. This index involves projects as a result of contribution of firms with the university (42%), its own financial statement (38%), cooperation with the university (10%). According to results of the index university management realized some of firms did not be well integrated with the university. After warning these firms, an increase in the number of academic advisor for firms occurred.

Boğaziçi University, BÜN Technopark Inc. has been founded in 2010 in order to create investment opportunities in technology-intensive areas, to create job opportunities for researchers and highly skilled people, to help the transfer of technology, technology commercialization and to provide infrastructure opportunities with the aim of creating new high-tech companies. Main aims of the BÜN Technopark are commercialization of technological knowledge, new and advanced technology for SMEs, helping technology transfer, providing technological infrastructure to accelerate the entrance of foreign investment, which provides advanced technology.

Currently Technopark has 26 firms. The goal of Technopark is increasing the number of firms with opportunities provided by BU, which are academic staff, laboratories, library, research supports, Small and Medium Enterprises Development Organization (KOSGEB) and TEKMER (incubator).

Boğaziçi University Technology Transfer Office was established in December 2012 in order to create an economic value and to assure its return to the University by transferring knowledge and technology from the University to industry. In this ecosystem, TTO works as an interface and facilitator to promote the collaboration with Industry and to utilize the funding sources effectively. TTO assists inventors, innovators and entrepreneurs in the process of converting their ideas into technology, commercializing the technology by transferring it to the industry and creating an economic value from which both society and university benefit mutually (Figure 4.4).

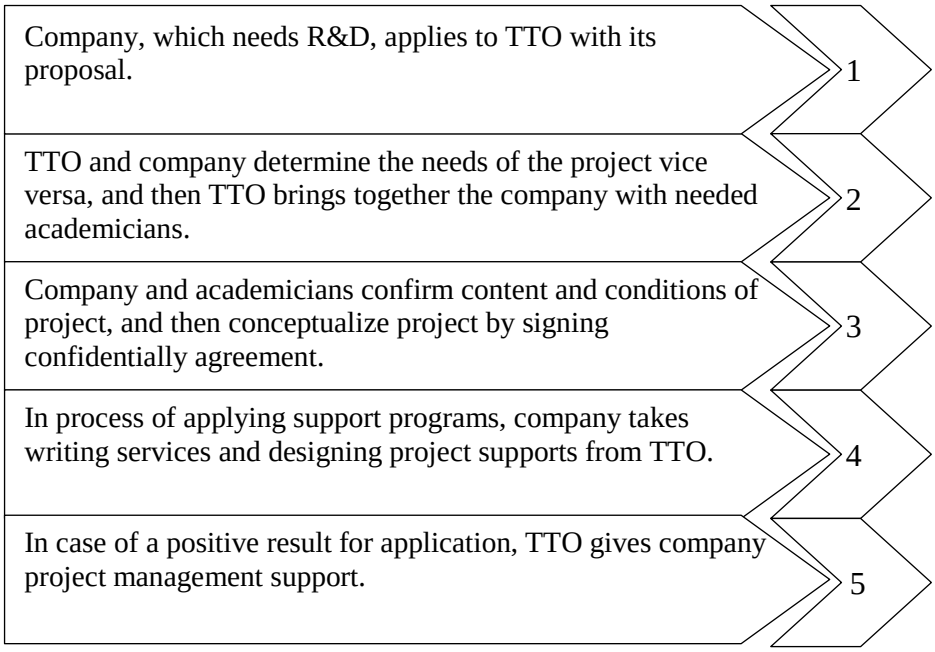

Figure 4.4: Working scheme of BU TTO (Url-31).

Sabancı University prefers to be a Group B founding shareholder of GOSB Technopark as Kocaeli University. Other partners of GOSB Technopark are Tefen Group, Gebze organized industry zone, Kocaeli Chamber of Commerce, and Gebze Chamber of Commerce. By this way Sabancı University stands at equal distance to all Technopark. Sabancı University and Technopark Istanbul signed a cooperation agreement. According to the agreement, Sabancı University Research and Graduate Policy Directorate will provide TTO services, Incubation Facility services and Technology Identification and Assessment services for one year, sharing institutional knowledge and experience from March 2014.

In Sabancı University, Research and Graduate Policies Directorate (RGP) is one of the most important units. RGP at Sabancı University assists research activities and innovation initiatives that aim to turn scientific and technological developments into social and economic benefits.

Under the RGP, there are three offices (Figure 4.5):

- Project Development Office
- Project Management Office
- Technology Transfer Office

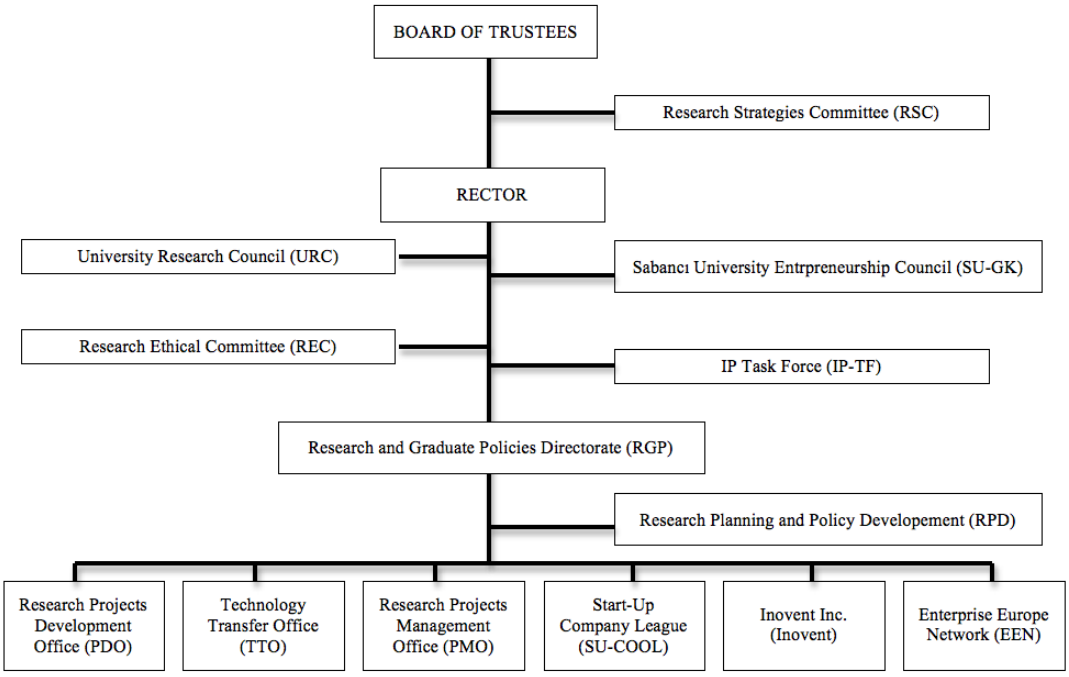

Figure 4.5: Sabancı University RGP organization scheme (Url-40).

Project Development Office, Project Management Office and Technology Transfer Office work cordially to carry out planning, development and management of research projects, development of any industrial relations and projects, innovation, technology transfer, and intellectual property management. RGP is a unique organization within Sabancı University as a model for other local universities. It supports not only the creation of strategic research targets and implementation of the policies built on these targets, but also research activities and innovative initiatives to obtain social and economic from scientific and technological developments. RGP seeks to achieve a sustainable research processes development in national and international competitive environments through its Research Planning and Policy Development function.

Sabancı University Technology Transfer Office formally established as of September 2011, under Research and Graduate Policies Directorate, the role of TTO is to facilitate commercialization of research activities. Our value proposition is to provide an interface where researchers and enterprises mutually enjoy opportunities for efficient transfer of knowledge and collaboration that will enable use of research outputs for the benefit of public and economy. TTO provides support to develop commercial R&D projects, individual consultancy projects and industrial services,

and follows-up of intellectual property processes related to project outputs. TTO also provides opportunity to practice project results in technology and business areas plus manages the process for the commercialization of technologies and business ideas developed in universities.

The main responsibilities:

- Responsible for developing the collaboration between the university and the industry, organizing launch meetings, contributing to the formation of any Commercial and Consultancy Projects, supporting its members' initiatives of such sort and paying visits to one other.
- Supporting the university member during the proposal's preparation process including budget.
- Preparing the contract for the Project in collaboration with Sabancı University's legal counselors and supporting the conducting of negotiations.
- Coordinates the management of intellectual property resulting from sponsored research with respect to IP disclosures, evaluations, patent applications and the referral of product-related outputs to commercialization process.

Under RGP, there are SUCool and Inovent. SUCool is a pre-incubator center, which provides support for students and graduates of SU, researchers, and entrepreneurs to implement their projects, which are value-added, are technology-R&D-innovation based, meet a real need.

Inovent is Turkey's first technology commercialization/accelerator and seed fund company that was founded by Sabancı University in 2006. Inovent focuses on academy-based entrepreneurship to manage the commercialization of early-phase technologies. SU has a wholly owned subsidiary, Inovent Inc, to support researchers and their work with collaboration of TTO. Inovent specializes in development, commercialization and management of intellectual properties developed by universities, research institutions, technology companies and entrepreneurs in Turkey.

The university has strong relations with leading firms and businessman in Turkey. In the context of relations with industry, the university raises qualified workforce for firms.

Table 4.18: Technology transfer in universities (Url-23, Url-24, Url-30, Url-31).

	Industrial cooperation	**Number of firms in technopark**	**TTO**	**Incubators**
ITU	ITU ARI Technopark (2002) / ITU Digital Base of Turkey / Automotive Technology Research & Development Corporation	91 firms, 2.068 R&D personnel	ITUNOVA TTO (2014)	KOSGEB, TEKMER
BU	BÜN Technopark Inc. (2010)	26 firms	Boğaziçi University Technology Transfer Office (2012)	KOSGEB, TEKMER
SU	GOSB (2005), Technopark Istanbul (2014)	16 firms in GOSB	RGP TTO (2011)	SUCOOL, INOVENT Inc.
BILGI	not exist	not exist	not exist	not exist

Boğaziçi University aimed to start BÜN Technopark much earlier but university did not have a suitable field. In 2010 when all conditions became suitable Technopark began operations in 2010 (Table 4.18). In Istanbul Technical University and Boğaziçi University, there are incubator centers as KOSGEB and TEKMER which are supported by government. Conversely, Sabancı University designed its own incubator centers as SuCool and Inovent Inc.

4.2.4.3 Graduates

Graduates of universities are considered as transferring knowledge directly to economic life and they are important as labor force. Istanbul Technical University and Boğaziçi University has a career development center in order to prepare students for their professional life. The centers have been established with the objective to assist students in getting acquainted with the business world before graduation and thereby help them to make a smooth transition into professional life.

In Boğaziçi University career development center, students can speak to the qualified staff of the center as well as meeting professional advisors who are experts in their fields. Appointments are required to meet professional advisors. In addition,

representatives of corporations and institutions, Human Resources managers and successful Boğaziçi graduates from diverse fields of work are invited to give seminars. Boğaziçi University has a database includes numbers and definitions of patents, thesis, publications, doctorate graduate from the year 1980.

In Sabancı University, 86% of the graduates found a job in their first year, 74% of them preferred private sector. 18% of them continued their academic career as master students. The rate of starting professional life in private sector is a proof that how relations are strong with the university and sector. Sabancı University raises qualified students for professional life. It can be said that Sabancı University has a knowledge and experience about professional life and private sector, rector and vice-rectors have their own companies. These types of enterprises increase their experience.

The most important aim of the university is raising their students as well qualified and ready for professional life in every possible way. This is why they have an innovation for teaching law. The university has a Career Center to serve all undergraduate and graduate students about discovering themselves, setting goals and reaching these goals in their personal, academic and professional development process. The center helps students with following issues:

- Mentorship Program: Students use graduates' job experiences by the program, which provides a network between graduates and students.
- Preparation for Professional Life and Personal Development Seminars: In an increasing competitive environment, seminars are organizing to uncover true potential of students and graduates in business.
- University-Industry Cooperation: The University provides students to recognize business world and benefit business experiences by firm trips and certification programs.
- Career Center support students with creating CV, coaching and counseling career, interview rehearsals.
- Social Responsibilities Program: In order to raise awareness of social responsibility, the university meets students with NGOs, and leads them to take an active role in these organizations.

Bilgi University is a university, which gives importance not just to education but also to prepare students all conditions in their professional lives. University has teaching

methods for this issue, such as bringing a new impulse to engineering education in Turkey by the concept of “engineering in life” with its young and qualified academic staff.

Table 4.19: Summary of Turkish cases in university transition.

Universities	Changed to…	How?
Istanbul Technical University (1773) Public University	- become a leader in research and technology, - build partnership with industry, - answer the demand of labor force, - answer the demand of standardization of curricula and degree programs, - respond to internationalization in education and research, - help SMEs gain access to the university staff, - enable institutes and firms a technopark, - increase project generation, - increase the rate of benefit from supports of national and international institutions.	- By preparing new management chart, - By assigning R&D coordinators, - By attaching importance to "communication office", - By setting vision, - By setting priorities, - By opening new faculties and programs, - By starting 100% English programs, - By entering into many bilateral international relationships, - By encouraging students, academic staff to promote R&D activities, - By opening ITU ARI Technopark, - By opening a technology transfer office, - By having incubators, - By determining core goals for technopark and technology tranfer office, - By increasing its research expenditure year by year, - By paying more attention to multidisciplinary projects.
Boğaziçi University (1863) Public University	- become more flexible and less bureaucratic, - achieve international excellence in education and research, - be environment-friendly, - be open-minded and technological friendly, - stimulate and facilitate students, graduates and staff to establish their own business, - build partnership with industry, - answer the demand of labor force, - answer the demand of standardization of curricula and degree programs, - respond to internationalization in education and research, - support R&D and entrepreneurship, - help SMEs gain access to the university staff, - enable institutes and firms a technopark, - increase project generation.	- By elaborating keeping tradition of Robert College, - By setting vision, - By having a "green" campus, - By using technological developments, - By opening BÜN Technopark Inc., - By opening a technology transfer office, - By offering education in 100% English, - By entering into many bilateral international relationships, - By its incubator centers, - By HayalEt Platform, Inovita Collaboration Platform, İşteBU Project Competition, - By giving importance to multidisciplinary projects.

Table 4.19 (continued): Summary of Turkish cases in university transition.

Universities	Changed to…	How?
Sabancı University (1999) Private University	- establish a "world university", - become an international reference point for innovation in education and research, - build partnership with industry and public institutions, - stimulate and facilitate students, graduates and staff to establish their own business, - make a greater contribution to the social, economic, cultural and environmental outcomes for regional communities, - answer the demand of labor force, - answer the demand of standardization of curricula and degree programs, - respond to internationalization in education and research.	- By planning a design period, - By setting vision, - By defining proactive strategies, - By preferring academicians who have work experience in different sector, - By offering education in 100% English, - By entering into many bilateral international relationships, - By establishing the Research and Graduate Policies Directorate, - By being a founding share holder of GOSB Technopark, - By signing agreement with Technopark Istanbul, - By opening a technology transfer office, - By having incubator centers.
Bilgi University (1996) Private University	- embrace freedom, - take a lead in the development of society, -make a greater contribution to the social, economic, cultural and environmental outcomes for regional communities, - answer the demand of labor force, - answer the demand of standardization of curricula and degree programs, - respond to internationalization in education and research - prepare students all conditions in their professional lives.	- By setting vision, - By beginning a long-term partnership with Laureate Education, - By creating the "European Institute", - By NGO Training and Research Center, Youth Studies Center, Children Studies Center, - By offering education in 100% English, - By entering into many bilateral international relationships, - By opening new faculties and programs, - By bringing new impulse to engineering education "engineering in life".

Same table as Table 3.4 in section 3 was prepared for Turkish universities (Table 4.19). First of all these four universities encourage students, academic staff to promote R&D activities, increase their research expenditure year by year and pay more attention to multidisciplinary projects because it is very important for these four universities to become an reference point for innovation in education and research. To respond to changing demands and conditions these universities improve management of university by preparing strategic plans, preparing new management chart, assigning new coordinators and designing themselves according to current environment.

Transferring technology is another important task for universities to be an important part of regional growth and economic development. Three of these universities have technopark or have agreements with technoparks, have incubators and technology transfer offices to increase project generation and help economic actors gain access to the university staff. These activities help building partnership with industry, moreover the knowledge-based economy benefits directly from stronger cooperation between universities and industries.

Under the conditions of the day it is not enough having success domestically, but also universities strive for acceptance in the international arena. Four case universities perform efforts to increase their recognition on the international stage by entering many bilateral international relationships, by offering education in %100 English. One of them began a long-term partnership with Laureate Education. In fact, all universities change under the context of knowledge based economy.

4.3 Discussion of findings

All universities that investigated have changes to be preferred, to be more innovative, to respond current conditions. These changes are seen in Istanbul Technical University and Boğaziçi University recognizable and more than Sabancı University and Bilgi University. Istanbul Technical University and Boğaziçi University have a history since their establishment, therefore they need to have more changes to respond current conditions. Sabancı University and Bilgi University are universities that established with awareness. They were designed due to respond current environment.

Istanbul Technical University and Boğaziçi University have made significant changes in management to better engage in R&D activities to be much more coordinated and particularly to address better and faster to the challenging requirements. However, these management changes were not seen in Sabancı University and Bilgi University. The reason why such a change is not seen is that both universities accept the fact that they have foreseen managerial requirements and organized theirselves prior to the foundation of the university.

Referring to the visionary statement of the 4 Turkish universities, being an international research university is crucial. Considering this and the fact that globalization is one of the fundamental drivers of knowledge-based economy, the approach and the visions of these universities show high parallelity with knowledge-based economy factors.

In the year 2006, public institutions in Turkey were obliged to prepare their institutional strategic plan as part of the European Union adjustment laws. Strategic plan is important for institutions as comprising medium and long-term goals, basic principles and policies, objectives and priorities, performance criteria, resource distribution and methods to be followed. Boğaziçi University prepared its first strategic plan in 2004, and Istanbul Technical University prepared in 2006. In the process of the Strategic Plan, Strategy Development Board was established at Boğaziçi University and Strategic Planning Committee was established at Istanbul Technical University. This transition was one of the most important changes in institutional structure for the two universities. Besides not having a strategic plan, the vision and mission of Sabancı University was formed, academic principles and four years of strategic objectives were identified. Bilgi University is currently working on university's institutional strategic plan.

The four cases develop proactive strategies to promote their research activities, industry relations, and participation social problems. Also these strategies show parallelity with knowledge-based economy factors.

Students in universities are qualified labor force of the future. Especially master and doctoral students as science professions are the main sources of knowledge-based economy. As seen in visions of the four cases being an international research university is crucial, in order to achieve this vision universities should have consciousness that institutions with a high density of research students are more

knowledge-intensive and that the presence of an active postgraduate community is a marker of a research-led teaching environment valued by undergraduates and postgraduates alike. Istanbul Technical University is the most populated in terms of master and doctoral programs.

Correspondingly academic structure is abundantly essential in consideration of training and resarch. ITU, BU and SU made some regulations for academic staff respecting progression, training and selection criterias of academic staff. These regulations serve to acquire more qualified and more international academic structure, remarkably Sabancı University have consciousness to generate an academic structure that enhance strong relationship with public and private sector. This step is very important for responding to today's laborforce requirements. Additionally, ITU and BILGI started education in special programs such as textile and gastronomy. These innovative acts appear as a result of development and motion of the two universities in this area.

4 case universities perform efforts to increase their recognition on the international stage for instance enlarging their exchange agreements day by day. Performance of Boğaziçi brings an invincible rank in The Times Higher Education World University Rankings. Over and above, it has been concluded that private universities are much more aggressive including their exchange agreements. In order to achieve success at the international level simply exchange movements is not enough, also attracting international students and academicians to attend the university is important. In terms of the number of international students and academicians, the four cases are far behind from success.

R&D and interdisciplinary projects constitute important place for the cases. Established technoparks are an important step with industry relations and participation of economic life directly. Technology Transfer Offices that arranges compatible ambience to get together knowledge and industry and provides all kind of support, began operation in ITU, BU and SU. TTO is one of the most important links in the economic development chain since these offices bring together university staff and medium, small and big sized enterprises.

Patent applications are seen as an important pillar of research and development. While the world's leading universities make average 120 patent applications in a

year, four case universities made total 74 patent applications since 2003. From this point, Turkish universities are not fully successful to be science and production hub.

Apparently, the 4 cases are working to raise a laborforce who are comply with current labor requirements easily. In particular Bilgi University standed out as a result of providing innovative educational approaches and applications. In knowledge-based economy, there is a great emphasis on entrepreneurship in the world. So the university should commercialize knowledge, ideas and technology coming from inside, on behalf of performing such an action, stimulate and facilitate students, graduates and staff to establish their own business by organizing entrepreneurship programs and competitions that includes students and graduates of universities (e.g. İşteBU Project Competition, SuCool).

In interviews all vice-rectors emphasis the importance of education and universities by means of knowledge-based economy. These four universities are aware of the necessity of change and all of them aim to have strong relations with economic actors, contribute economic development with their graduates and projects. Visions and strategies of the 4 cases, serve to that change. Investments in technology and innovation, R&D activities, technoparks, newly opened technology transfer offices, increase of projects, increase of the received supports for projects (e.g. TUBITAK supports), increase of support appraisal competition (Entrepreneurship and Innovation index) in these 4 universities reveal this change.

As a consequence, the universities in the case study experienced transition. Although these tranisitions didn't radically change the structure of the universities bottom to top, it let them to become more international, more contrubutive to the economic development. It also let them to have more interconnected relationship with relevant actors in the market. To further extent this study showed that the transition process has not been completed for all of them. So it is for sure that these universities will continuously change and adopt theirselves to the new challenges in the future.

5. CONCLUSION

"Knowledge is power." Today most of researchers accept that wealth is coming with the production of knowledge. Knowledge is recognized as a crucial element of economic growth. Therefore sustainable development is possible with knowledge creation, knowledge flows, and the capitalization of knowledge. Since the knowledge became primary raw material of economy, the knowledge-based economy has become the major trend in international society in the 21st century.

Globalization and developments in information technologies clear the way for knowledge-based economy. And this new economic era is so dynamic and full of technology. As knowledge producers, universities are becoming crucial for regional, national economic development with this new economic era. Governments give important roles to the universities by putting them right into the center of economic development for the reason that the commercial value of knowledge can be increased. Having such important role assigned to universities, they need to keep up with these new conditions and have transition to survive.

Both in world and Turkish universities' cases, it is seen that they develop strategies to be a strong part of economic development; work to be a world-class university; evolve their educational missions and methods; exchange staff and students, join international groups and cooperate actively with their management decisions. Universities standardize curricula and degree programs for being international; promote academic staff's quality and catch technological developments in teaching and research. To promote their productivity, universities focus on research and knowledge creation; promote the linkage with industry by developing and exchanging knowledge with opening new units like technoparks, technology transfer offices; enlarge interdisciplinary activities and collaborations by encouraging in every aspect. Furthermore, they give more importance to graduates as labor force to meet demands for new qualities in human capital development.

Technical University of Berlin, University of Glasgow, Newcastle University, set their mission and strategies through the changing role of university as knowledge hub, being innovative, promoting their role in economic, social and cultural development of their region. Georgia Institute of Technology, University of Potsdam established technoparks, technology transfer offices and university centered knowledge hub initiatives.

Technical University of Berlin, University of Glasgow, and Georgia Institute of Technology introduce international programs, which provides distance education. University of Leeds opens a staff development unit to build researchers skills at the university. There are special European Union Projects to build partnership with industry and public institutions and build collaborative partnership. These 15 universities work with local governments, employers, other universities, and society. They all have success about that contribution.

The main hypothesis of this thesis is that there is a transition in universities by means of knowledge-based economy. The main hypthesis is followed by three research questions. They are as follows: How Turkish universities respond the expectations of knowledge-based economy? Where is the place of Turkish universities in the institutional change around the world that required by knowledge-based economy? Which are affected by this transition process, which affect this transition process in Turkish universities?

With regards to solid references and considered the world cases in this study, obviously Turkish universities also experienced transition in similar fields. According to that, the main hypothesis at the origin of this thesis that there is a transition in universities by means of knowledge-based economy and the case study can be accepted and verified.

The expectations of knowledge-based economy from universities are being one of the most important institution for regional growth, supporting wealth and economic development; to achieve this goal being more active about knowledge creation, research and development activities, improve management of university, transferring technology, succeeding in international arena, increasing cooperation with industry, public institutions, non-governmental organizations, society.

First of all these four universities encourage students, academic staff to promote R&D activities, increase their research expenditure year by year and pay more attention to multidisciplinary projects because it is very important for these four universities to become an reference point for innovation in education and research. To respond to changing demands and conditions these universities improve management of university by preparing strategic plans, preparing new management chart, assigning new coordinators and designing themselves according to current environment.

Transferring technology is another important task for universities to be an important part of regional growth and economic development. Three of these universities have technopark or have agreements with technoparks, have incubators and technology transfer offices to increase project generation and help economic actors gain access to the university staff. These activities help building partnership with industry, moreover the knowledge-based economy benefits directly from stronger cooperation between universities and industries.

Under the conditions of the day it is not enough having success domestically, but also universities strive for acceptance in the international arena. Four case universities perform efforts to increase their recognition on the international stage by entering many bilateral international relationships, by offering education in %100 English. One of them began a long-term partnership with Laureate Education.

In fact, all universities change under the context of knowledge based economy. All these changes, increase the interdependency both instutionally and internationally, also contribute positively to the production of knowledge and ease its transfer with fluency to all relevant parties. Thus, this is how Turkish universities respond the expectations of knowledge-based economy.

The second research question was answered by evaluating the place of Turkish universities in the institutional change around the world. The world cases officially evaluate their roles as knowledge hub and innovative university. Turkish universities continue as education and research universities, they did not attend changing roles. Fundamental destinations of world cases are advancing technology and economic development in their regions and being a part of regional development. While setting similar targets in Turkish universities, there is not a clear statement as the world cases in the sense of contribution to regional development.

Technoparks and technology transfer offices in Istanbul Technical University, Boğaziçi University and Sabancı University show that there are initiatives for promoting industry relations and being an important and strong part of economic development likewise all around the world. However, projects give regional values prominence and aim to achieve regional development in this direction in the world. For instance, opening an Institute in a university with the Ceramic Industry Research Association to response to the needs and demands of companies from Spanish ceramic cluster.

Both in the world cases and in the Turkish cases, stimulating and facilitating graduates and staff to establish their own business and encouraging students and academic staff to promote R&D activities rank in priority. Patent applications are seen as an important pillar of research and development. While the world's leading universities make average 120 patent applications in a year, four case universities made total 74 patent applications since 2003. From this point, Turkish universities are not fully successful to be science and production hub.

Being international is very important. The ratio of international to domestic students and staff of the world cases is very high. In terms of attracting international students and academicians to attend the university, Turkish universities are far behind the world standards.

As an answer for the third question, European Union adjustment laws affected Turkish universities. The institutional structure of universities had transition with the strategic plan becomes compulsory. Bologna Process affected Turkish universities; they increase their bilateral agreements day by day. Acceptance of English as the common international language affected Turkish universities; they began education in 100% English. Governmental policies affected Turkish universities; technology transfer offices were established in universities to answer the demand of R&D activities and policies to increase collaborations with industry. Measuring clearly university's contribution to the economy and development is not easy. However, their contribution to development is obvious via both their graduates as labor force, their benefits in terms of R&D contributes and their increasing cooperation with other economic actors.

The world cases have more to the point approaches. When Turkish universities develop this type of approaches, they will become more successful both in national

and international level. As a result, it was concluded that the four important Turkish universities' evolution from their foundation until today has parallels with the evolution of universities abroad.

With this opportunity, it should also be underlined that world cases started to make transition by means of knowledge-based economy since 1970s. In Turkey, evolution of universities escalate to 2010s'. However, they've taken huge steps on short notice and could get aligned with its counterparts in the world. The universities have more intense and conscious changes about being an important part of knowledge-based economy although lagging behind in terms of timing.

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APPENDICES

APPENDIX A: Deep Interviews

APPENDIX B: Table of Interuniversity Entrepreneurship and Innovation Index

APPENDIX A

- Prof. Dr. Atilla Eriş the Vice-Rector in Istanbul Bilgi University who is responsible for academic matters, Research Office, Bologna Office and International Center. Interview date: Interview date: 17.02.2014, interview time: ca. 40 minutes. Personal e-mail: atilla.eris@bilgi.edu.tr, address: Eski Silahtarağa Elektrik Santrali, Kazım Karabekir Cad. No: 2/13 34060 Eyüp, İstanbul.
- Prof. Dr. Mehmet Sabri Çelik the Vice-Rector in Istanbul Technical University. Interview date: 04.03.2014, interview time: ca. 90 minutes. Personal e-mail: mcelik@itu.edu.tr, address: İstanbul Teknik Üniversitesi Maden Fakültesi Cevher Hazırlama Bölümü 34469 Ayazağa, İstanbul.
- Prof. Dr. Hasan Mandal the Vice-Rector in Sabancı University and the Director of Research and Graduate Policies. Interview date: 06.03.2014, interview time: ca. 40 minutes. Personal e-mail: hmandal@sabanciuniv.edu, address: Sabancı Üniversitesi, Orta Mahalle 34956 Tuzla, İstanbul.
- Prof. Dr. Lale Akarun the Vice-Rector in Boğaziçi University who is responsible for research, industry relations, IT infrastructure, academic staff training. Interview date: 13.03.2014, interview time: ca. 90 minutes. Personal e-mail: akarun@boun.edu.tr, address: Bilgisayar Mühendisliği Bölümü, Boğaziçi Üniversitesi 80815 Bebek, İstanbul.

APPENDIX B

Table B.1: Interuniversity Entrepreneurship and Innovation Index 2012* (Url-60).

Rank	University	Total	Competency of Scientific and Technological Research	Intellectual Property	Cooperation and Interaction	Entrepreneurship and Innovation Culture	Economic Contribution and Commercialization
1	SABANCI ÜNIVERSITESI	84	19,2	9,2	25,0	12,5	18,3
2	ORTA DOĞU TEKNIK ÜNIVERSITESI	83	18,9	10,6	22,2	12,2	18,8
3	İHSAN DOĞRAMACI BILKENT ÜNIVERSITESI	70	18,3	6,5	22,8	4,5	18,2
4	ÖZYEĞIN ÜNIVERSITESI	69	13,3	6,5	19,3	10,9	18,8
5	İSTANBUL TEKNIK ÜNIVERSITESI	67	15,9	7,8	20,1	7,4	15,9
6	BOĞAZIÇI ÜNIVERSITESI	65	19,0	0,9	24,2	3,4	17,1
7	İZMIR YÜKSEK TEKNOLOJI ENSTITÜSÜ	58	18,8	1,8	18,1	3,3	16,2
8	KOÇ ÜNIVERSITESI	57	17,2	5,9	22,2	9,9	2,2
9	GEBZE YÜKSEK TEKNOLOJI ENSTITÜSÜ	57	18,4	3,8	17,5	6,3	11,1
10	TOBB EKONOMI VE TEKNOLOJI ÜNIVERSITESI	54	16,1	0,0	19,2	6,8	12,2
11	HACETTEPE ÜNIVERSITESI	49	13,5	5,5	13,6	6,6	9,5
12	EGE ÜNIVERSITESI	47	13,6	5,0	15,1	7,6	5,6
13	ERCIYES ÜNIVERSITESI	46	11,3	6,7	6,7	8,1	13,3
14	SÜLEYMAN DEMIREL ÜNIVERSITESI	45	12,6	6,4	9,7	2,1	13,9
15	GAZI ÜNIVERSITESI	44	11,1	3,3	9,5	7,6	12,4
16	SELÇUK ÜNIVERSITESI	43	9,1	6,4	8,1	6,1	13,6
17	ÇANKAYA ÜNIVERSITESI	43	10,4	7,1	11,5	7,6	6,3
18	BAHÇEŞEHIR ÜNIVERSITESI	43	11,8	4,7	13,6	3,8	9,1
19	YILDIZ TEKNIK ÜNIVERSITESI	41	10,8	5,0	15,3	6,8	3,0
20	ÇUKUROVA ÜNIVERSITESI	41	10,9	0,9	14,5	5,0	9,3
21	YEDITEPE ÜNIVERSITESI	40	10,7	11,9	13,4	1,1	2,9
22	AKDENIZ ÜNIVERSITESI	39	10,8	4,0	8,3	6,6	9,6
23	ANKARA ÜNIVERSITESI	37	12,4	2,7	11,3	2,6	7,9
24	KOCAELI ÜNIVERSITESI	37	8,2	2,9	10,0	4,2	11,2
25	ULUDAĞ ÜNIVERSITESI	37	9,4	6,1	12,4	1,6	7,0
26	ATILIM ÜNIVERSITESI	35	9,7	0,0	13,5	1,3	10,5

Table B.1 (continued): Interuniversity Entrepreneurship and Innovation Index 2012* (Url-56).

Rank	University	Total	Competency of Scientific and Technological Research	Intellectual Property	Cooperation and Interaction	Entrepreneurship and Innovation Culture	Economic Contribution and Commercialization
27	DOKUZ EYLÜL ÜNIVERSITESI	35	9,8	4,7	10,7	5,3	4,1
28	GAZIANTEP ÜNIVERSITESI	33	9,8	1,4	7,9	5,9	8,5
29	MERSIN ÜNIVERSITESI	33	7,9	3,5	4,9	6,2	10,7
30	KADIR HAS ÜNIVERSITESI	33	12,7	0,0	16,4	3,8	0,0
31	KARADENIZ TEKNIK ÜNIVERSITESI	32	10,5	0,4	8,0	2,1	11,2
32	IŞIK ÜNIVERSITESI	31	9,1	0,0	10,2	3,8	8,4
33	ATATÜRK ÜNIVERSITESI	31	11,1	4,0	3,6	7,4	5,2
34	İZMIR EKONOMI ÜNIVERSITESI	31	8,3	4,4	5,8	8,6	3,8
35	İSTANBUL ÜNIVERSITESI	30	9,0	2,5	7,9	5,9	5,0
36	DÜZCE ÜNIVERSITESI	30	7,1	3,4	6,9	5,5	7,2
37	ANADOLU ÜNIVERSITESI	30	8,6	0,9	8,5	3,5	8,5
38	SAKARYA ÜNIVERSITESI	29	7,9	6,3	8,0	1,0	6,2
39	FIRAT ÜNIVERSITESI	29	10,3	0,6	6,4	1,4	10,2
40	PAMUKKALE ÜNIVERSITESI	29	8,7	2,7	7,6	2,7	7,0

* 2011 yılı YÖK verilerine göre 50 ve altında Prof. + Doç. + Y.Doç'a sahip 42 üniversite hesaplamalara dahil edilmemiştir.* Veriler normalize edilirken Prof. + Doç. + Y.Doç toplamı kullanılmıştır. * Veriler standardize edilirken min-max yöntemi kullanılmıştır.* Ağırlık: Birinci boyut:20, İkinci Boyut: 15, Üçüncü Boyut: 25, Dördüncü Boyut: 15, Beşinci Boyut: 25

Table B.2: Interuniversity Entrepreneurship and Innovation Index 2013 (Url-56).

Rank	University	Total	Competency of Scientific and Technological Research	Intellectual Property	Cooperation and Interaction	Entrepreneurship and Innovation Culture	Economic Contribution and Commercialization
1	ORTA DOĞU TEKNİK ÜNİVERSİTESİ	86,0	19,2	11,2	21,9	15,0	18,8
2	SABANCI ÜNİVERSİTESİ	85,8	20,0	10,1	25,0	13,4	17,3
3	İHSAN DOĞRAMACI BİLKENT ÜNİVERSİTESİ	82,7	19,9	9,6	23,3	11,9	18,0
4	BOĞAZİÇİ ÜNİVERSİTESİ	76,3	20,0	7,3	22,8	11,1	15,1
5	İSTANBUL TEKNİK ÜNİVERSİTESİ	72,5	16,2	7,7	20,9	9,2	18,5
6	İZMİR YÜKSEK TEKNOLOJİ ENSTİTÜSÜ	68,1	19,8	3,8	22,0	5,8	16,9
7	ÖZYEĞİN ÜNİVERSİTESİ	67,4	11,9	3,8	20,8	13,7	17,1
8	KOÇ ÜNİVERSİTESİ	61,7	17,1	7,5	23,8	9,6	3,6
9	TOBB EKONOMİ VE TEKNOLOJİ ÜNİVERSİTESİ	57,0	16,7	3,8	19,7	2,3	14,6
10	HACETTEPE ÜNİVERSİTESİ	56,7	14,8	6,3	16,2	9,4	10,0
11	SELÇUK ÜNİVERSİTESİ	55,2	11,6	8,2	13,3	9,9	12,2
12	GAZİ ÜNİVERSİTESİ	54,9	11,1	6,3	13,3	12,1	12,1
13	GEBZE YÜKSEK TEKNOLOJİ ENSTİTÜSÜ	54,7	18,7	3,8	18,3	3,9	10,0
14	EGE ÜNİVERSİTESİ	53,0	12,8	4,2	16,6	12,8	6,6
15	YILDIZ TEKNİK ÜNİVERSİTESİ	49,6	12,4	3,3	15,4	9,1	9,4
16	ANADOLU ÜNİVERSİTESİ	47,9	7,9	5,4	13,5	11,3	9,7
17	ÇUKUROVA ÜNİVERSİTESİ	46,9	12,0	0,5	15,9	7,6	10,8
18	YEDİTEPE ÜNİVERSİTESİ	45,9	10,8	9,1	15,2	6,2	4,6
19	ÇANKAYA ÜNİVERSİTESİ	45,8	9,3	7,0	13,1	3,7	12,6
20	ATILIM ÜNİVERSİTESİ	44,6	10,3	0,0	18,5	3,1	12,7
21	ERCİYES ÜNİVERSİTESİ	44,5	11,3	3,7	10,6	6,8	12,2
22	SÜLEYMAN DEMİREL ÜNİVERSİTESİ	44,5	10,9	5,4	11,5	3,5	13,2
23	KOCAELİ ÜNİVERSİTESİ	44,0	9,9	1,8	10,0	10,3	12,0
24	BAHÇEŞEHİR ÜNİVERSİTESİ	42,5	8,6	5,7	15,9	3,8	8,5
25	AKDENİZ ÜNİVERSİTESİ	42,0	9,9	3,2	12,5	6,9	9,4

Table B.2 (continued): Interuniversity Entrepreneurship and Innovation Index 2013

Rank	University	Total	Competency of Scientific and Technological Research	Intellectual Property	Cooperation and Interaction	Entrepreneurship and Innovation Culture	Economic Contribution and Commercialization
26	ANKARA ÜNİVERSİTESİ	41,8	12,2	1,8	11,1	8,2	8,6
27	MERSİN ÜNİVERSİTESİ	41,8	8,6	3,8	7,3	5,6	16,4
28	GAZİANTEP ÜNİVERSİTESİ	41,7	9,8	4,4	10,8	8,9	7,8
29	ULUDAĞ ÜNİVERSİTESİ	39,9	8,9	4,5	14,8	5,1	6,7
30	KARADENİZ TEKNİK ÜNİVERSİTESİ	39,7	10,8	0,7	10,3	7,5	10,5
31	DÜZCE ÜNİVERSİTESİ	38,4	7,3	3,8	13,7	6,2	7,4
32	DOKUZ EYLÜL ÜNİVERSİTESİ	38,3	9,2	2,8	13,3	7,6	5,4
33	KAHRAMANMARAŞ SÜTÇÜ İMAM ÜNİVERSİTESİ	37,7	9,8	5,2	15,2	5,3	2,2
34	FIRAT ÜNİVERSİTESİ	33,3	10,8	0,2	7,9	1,6	12,8
35	İZMİR EKONOMİ ÜNİVERSİTESİ	32,6	7,5	0,0	11,8	9,6	3,8

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